RELIGION IN AN AGE OF SCIENCE

EDWIN A. BURTT

SYRACUSE UNIVERSITY 10125097
Religion in an age of science,
215.B97R
3 2911 00682526 9

B97r
215
Burtt
Religion in an age of
science
156133

FEB 28 58
DEC 15-54
MAY 19
MAY
MAR
OCT
JL
M

DATE LOANED

2 Feb '37 O
8 Mar '38 T
overnight
31 Mar '49 O
5 May '50 M V
18 May '34 T
19 May 52 [illegible]
2 weeks here
15 Dec '54 P G
23 Apr '36 L
12 May '55 P G
9 Dec '36 N
12 Feb '58 L N
9 May '39 H
28 Feb 58 RU pd.
22 Mar '40 W
18 May '62 V W
16 Apr '41 R A
6 Jun '64 M
8 Apr '43 N
29 MAR '65 J G
2 Mar '44 W
3 JUN '65 J D
1 Mar '44 K
28 NOV '65 J S
31 Jul '44 G R
22 Mar '45 A
12 JUN '66 M K
24 Jul '[illegible]
5 Oct '48 M

"RELIGION AND THE
MODERN AGE" Series

RELIGION IN AN AGE OF SCIENCE

"RELIGION AND THE MODERN AGE" Series

Edited by JOHN HERMAN RANDALL

A series of brief, clearly written books dealing constructively with the problems of present-day religious life in the light of modern knowledge and modern social conditions.

ALREADY PUBLISHED

RELIGION AND THE MODERN WORLD
By John Herman Randall
and John Herman Randall, Jr., Ph.D.

RELIGION IN AN AGE OF SCIENCE
By Edwin A. Burtt, Ph.D.

Other Volumes in Preparation

"RELIGION AND THE MODERN AGE" SERIES
Edited by JOHN HERMAN RANDALL

RELIGION in an AGE of SCIENCE

By EDWIN A. BURTT, PH.D.
DEPARTMENT OF PHILOSOPHY, UNIVERSITY OF CHICAGO
Author of "The Metaphysical Foundations of Modern Physical Science," "Principles and Problems of Right Thinking," etc.

FREDERICK A. STOKES COMPANY
NEW YORK MCMXXIX

COPYRIGHT, 1929, BY FREDERICK A. STOKES COMPANY

PRINTED IN THE UNITED STATES OF AMERICA

V5
47r
3L
240
B83

DEDICATED

TO

MY WIFE

156133

CONTENTS

CHAPTER		PAGE
	Foreword by the General Editor	ix
	Foreword by the Author	xiii
I	The Human Meaning of Science . . .	3
II	The Notion of Universal Law	29
III	The Tentativeness of Scientific Thinking	62
IV	The Effect of Science upon Philosophy .	94
V	The Conflict of Science and Religion—and Their Reconciliation	121

FOREWORD

By the General Editor

During the 19th century many notable religious leaders attempted to reconstruct traditional religion in the face of the criticism of natural and social scientists and of the social needs of that age. Progressive religion today owes a great debt of gratitude to those pioneers: it is still largely following in their footsteps. But the present generation has seen an intellectual and a social revolution that makes all previous attempts to adapt the religious and moral inspiration of the past to the needs of the modern world seem outgrown and inadequate. The interpretation of the world generalized from 19th century natural science, against which sensitive and high-minded men felt compelled to protest as inadequate to human experience, has been completely altered and enriched by the scientists themselves. The crude theories of earlier social scientists as to the nature and function of religion are now seen as the groping attempts of a science in its infancy. 19th century philosophies, chiefly protests in the name of human experience against an inadequate and incomplete science, have given way to philosophies that grow out of a broader scientific knowledge and a more flexible intellectual method. Most significant of all,

a matured industrial society has awakened this generation to moral and social problems that seem incapable of solution without going far beyond any of the elements, however purified, of the religious tradition.

In the light of these changed view-points and problems, thoughtful men today no longer approach the religious life in the spirit of their fathers. They no longer seek to cling to as much of tradition as they can save from an encroaching science. They no longer try to secure an intellectually respectable faith by paring away what has been destroyed. They no longer resort to imposing philosophies that will bolster up the essence of traditional religious beliefs in the face of science, nor do they seek in scientific concepts, like evolution, a substitute just as good. Nor is it enough for them to fall back on the core of moral idealism in Judaism and Christianity as a sufficient gospel for our age. The religious conflicts of the last century leave them cold, because it seems to them as futile to attack or defend religion in general as to approach the other great enterprises of art or science in such a controversial spirit.

To those familiar with the intellectual and practical attitudes of today, the religious life is a natural part of human experience, to be studied, assimilated, lived, and developed like any other great human institution. It has manifested itself in various forms in different societies, and has normally played a vital

part in close connection with the intellectual beliefs, the emotional and artistic expression, and the moral conduct and ideals of those societies. What interests the man of today is the needs of human nature religion has met, and how it has satisfied them most richly and effectively. What he wants to know is not how much traditional doctrine he can still believe. It is something far more than that: it is what organization of the religious life, intellectual, emotional, and social, will best meet the religious demands of men living in our present age. How can he express his religious feelings of piety toward the sources of his being and aspiration toward a fuller life in such a way that he will not find them in conflict with the rest of contemporary experience, but rather a source of further consecration and inspiration? He does not want a religious faith he will have to defend against his other interests; he wants a faith that, springing naturally from them, will carry him beyond them.

There are many men who have been working at these problems; but the great mass of literature dealing with religious adjustment and reinterpretation still concerns itself with the conflicts of the past generation rather than with the present. There has been as yet no systematic attempt to deal, in a way the ordinary man can understand, with the problems of contemporary religious life in the light of the most recent science and philosophy and with a full

realization of the implications of present-day social tendencies. In the series "Religion and the Modern Age" it is hoped to enlist men abreast of the thinking and civilization of our own day. They will treat the religious issues of today and tomorrow, not those of yesterday. They will address themselves to the many who are seeking a more adequate faith than traditional orthodoxy, or than the liberal compromises of the last century. Progressive religion can not stand still; it must either advance to deal concretely and intelligently with its problems, or else disappear before orthodox traditionalism and religious indifference. It needs all the criticism, guidance, and inspiration it can find. Each in his own way, the men who write in this series will try to give it such help.

JOHN HERMAN RANDALL
General Editor,
"Religion and the Modern Age" Series

New York City
February 22, 1929

FOREWORD

Most of the material in the following chapters was presented in lecture form before the Institute of World Unity at Green Acre, Maine, during the week of August 13, 1928, and has been published as a serial in World Unity. I wish to thank the Director of the World Unity Foundation and the Editor of World Unity for their kind permission, nay encouragement, to give the suggestions here embodied wider publicity and more permanent form by including them within the present series.

Grateful thanks are due to my wife, whose aid in revising the manuscript has been especially valuable.

E. A. BURTT.

Chicago, Ill.
April, 1929.

"RELIGION AND THE
MODERN AGE" Series

RELIGION IN AN AGE OF SCIENCE

RELIGION IN AN AGE OF SCIENCE

Chapter I

THE HUMAN MEANING OF SCIENCE

The modern age is the age of science. What does this mean for life in general and for religion in particular?

This is a much discussed topic. It would be futile to embark upon it were we merely to plow over old ground. Let us disavow at once and without ceremony the conventional approach of those who wish to defend the validity of religion, either in some traditional form or in one redefined to suit the whim of the defender. Let us likewise avoid any bias against religion. Whatever else it may be, religion is certainly a hoary means for the satisfaction of persistent human needs. May we not agree, in fact, at the start that both religion and science are seriously practised techniques for attaining something that people want. Wherein lies the conflict between them and how is it to be reconciled?

It is a more novel thing to live in an age of science than in an age of religion unaffected by science. Religious the world has always been; as would-be scientist it is but a child. This fact suggests that it will be a helpful program to leave religion by the wayside for a time and attack first the source of this novelty. Let us determine if we can what science is and how life tends to be affected by it when it becomes so prominent a factor that we may pertinently speak of an age of science. We may return to religion with profit when we have grasped clearly the human meaning of science.

Most people know science as they know God, by works rather than by intimate vision. When asked what science means to them, they will reply by pointing to the more or less startling discoveries offered on the authority of men of science. These novel conceptions of the laws according to which the universe operates, embodying the authenticated outcome of scientific investigation, almost exhaust the meaning of science for the popular mind—a situation entirely natural in an era in which science has won prestige and power but in which scientists themselves are yet rare and minds that reflect on the larger connections of science rarer still. For the man whose interest is predominantly practical, as is the case with most of us, this authority gained by science over his thinking will be due to the obvious part scientific knowledge has played in inventing the tools by which human control over nature during the last century and

a half has so vastly increased. The evidence of this function of science is noisily thrust upon him in the railroad, the telegraph, the radio, the aeroplane; its still more startling extension is promised him by preliminary experiments on television, on the dissection of the atom, and on glandular injection. No one with alertness of mind could survive the Great War and note the extent to which scientific research was commandeered by both sides in a supreme effort to master hitherto unmastered forces that might spell victory in the struggle, nor the manner in which, especially since the war, scientific foundations have proved themselves essential to any industrial corporation striving to weather the stress of competition, without realizing that science is an enterprise of enormous practical concern. It is evidently its business to attain a kind of knowledge whose possession is indispensable in the race for power and prosperity. Indeed, none of us moderns would really be willing to surrender what science has secured and attempt to get along without it; accordingly, the man who recognizes this fact, even though he have no more lucid vision of what science stands for, will find himself in a sense irrevocably committed to it. Though the pressure of some opposing prejudice may foster in his feeling a lingering distrust of scientific investigation he cannot abandon himself to such motives without reservation. As a clearly proven means to ends so firmly buttressed by normal human desires that he cannot help shar-

ing them science commands his respect and secures his submission to its authority.

The average modern man, then, accepts science without understanding much more about it than that it reaches results which cannot be contradicted and are often of help in attaining coveted goals. But this is a rather external and superficial notion of what science means. Its stancher effect on life may be almost completely escaped when we regard it simply as a set of results about the nature of the world to be appropriated and applied when they have become duly attested. Especially will its bearing on religion be quite missed. Science has never made any discovery, nor is likely to make any, that religious faith cannot in time be brought, however grudgingly, to adopt. Every generation sees some religious dogma surrendered because it conflicts with scientific truth. But no such retreat brings about a transformation in the relations of science and religion thoroughgoing enough to make future surrenders no longer necessary. And it is surely clear that until such a situation is reached religion and science have not been really reconciled. If we would reach the heart of the conflict we must find in science something more than this popular view admits.

If one seasoned in the procedure of scientific enquiry—a scientist, in short—be asked what science is, he will almost certainly point not to its results but to its method. For him, science is mainly a way of reaching results that may justify confidence when

established by it, a way gradually built up through centuries of arduous intellectual effort. It is in what he feels to be the essential characteristics of this method that he will find the human meaning of science. In his answer to the question he will point therefore to such matters as his principles of observation, by which data likely to be significant are uncovered; his use of already attested knowledge in the formation of hypotheses and their development; his technique of experimental verification and the laboratories and delicate instruments which constitute indispensable aids in this verification; likewise to the fundamental concepts such as atom, space, mass, cell, nucleus, evolution, reflex, which as ideas guiding research have proved themselves uniquely fruitful in attacking his problems. Science means to him an appealing enterprise which carries on by this method, and if he be teacher as well as investigator he will care far more to permeate the minds of students who come to him by the habits of thinking which disclose themselves in this method than to have them accept the outcome of his investigations on the ground of external authority, however obviously well founded.

Now to have advanced this step in understanding the meaning of science is to have made a great gain in our appraisal of it. But it may be that even this conception of science as a method of enquiry into nature fails to give us the needed clue, again with particular reference to the relation between science

and religion. Let us see why. On these terms the solution of the problem of science and religion might seem to be fairly easy. For, taken by and large, the method of religion is obviously very different from that of science. The religious man worships; the scientific man enquires. The two enterprises have different fields in human experience, then, we might quickly conclude, and each is valid within its own appropriate realm.

Under this head may be classed most of the recent attempts to harmonize science and religion. And if you wish to settle the matter in this fashion the procedure is quite simple. First you show that the legitimacy of scientific knowledge has been established over a restricted field merely. Then you contend that in the wider ranges of reality at large faith in God and in the traditional holies of religion is still warranted. And by such manœuvres you assume that the reconciliation is made.

One of the most astonishing forms of this dichotomy—astonishing, that is, in its ability to win approval among religious circles—seems to me to be found in the cavalier manner in which religion has been justified in recent years by men of science who happen also to be souls of stalwart piety. These men are concerned to point out the fact that the island of assured knowledge possessed by science is ever surrounded by an ocean of mystery. A legitimate field for the exercise of religious faith is then found simply in this consideration. Now it is not at

all my purpose to take issue with the fact thus affirmed. Surely at no given time does science know all that we should like to know. Nor would I dispute the contention that in the appropriate object of religious feeling an element of transcendence of finite knowledge, even of overwhelming mystery, is present. The thing that astonishes me is that these matters, taken in themselves, should seem to offer an adequate basis for religion, and that the questions that ought to be asked about such a foundation are not usually asked. For surely, on the one hand, the natural response of the scientist, as scientist, to this realm of the unknown, is wholly agnostic and experimental; he admits his ignorance of it without any necessary bow of reverence, and is ready to entertain, again without any complication with feelings of adoration, hypotheses that might lead to verifying experiments on the nature of this or that specific part of it. And on the other hand, if we may take the history of theology as yielding any significant deliverance, the God of religious experience is surely far more than a mere Great Unknown. Is the Great Unknown personal? Of course we do not know. Is it morally good, bad, or indifferent? Again we do not know. Is it eternal, or is the advancing march of science destined to conquer it entirely at some distant but finite time? A third time we cannot say. Is it really the God of religion about which we cannot make an affirmative answer to even such questions as these? Surely this we can answer

with a flat negative. And it might well seem to a Rip Van Winkle who should suddenly pop into our midst from an age of more vivid religious certainties a pathetic testimony to the complete intellectual bankruptcy of faith that anyone should seriously cling to such a straw as this fact of mystery in his endeavor to avoid engulfment in the abyss of scepticism. At any rate it indicates clearly that an adequate reflective grounding for religion in the light of the forces actually moulding the modern world remains unattained.

We have evidently followed too trustfully the clue offered by the contrast in method of science and religion. Both are going concerns within the same world after all. And so far as each involves convictions about the nature of that world claiming the right to govern feeling and guide practice they jostle against a common standard and become comparable on the same plane of experience. Both have their being in human minds. Like quarrelsome brothers they must be brought to sit at the same table; they cannot be permanently insulated in separate rooms.

It must be then that the human importance of science lies in the end neither in its specific discoveries nor in its method. Where does it lie?

The answer I suggest to this question may be stated very simply, though it will need detailed exposition. Let us recall our assumption at the beginning that both science and religion are ways of sat-

isfying human need. Now the performance of any task that satisfies need has a value, and the value is greater according as the need is more indelible and more general. I believe that the unique value of science, resulting from the nature and importance of the need that it meets, gives the clue to its larger meaning for life. In fact, I think that the method of science is what it is, and the discovered laws take the form they do, simply because the purpose of science in relation to human need is what it is. Further, and this is the most significant point, since the conscious pursuit of any value reflects a certain interest or attitude on the part of those who pursue it, which is morally judged in its relation to other interests, the value for which science stands has a moral or spiritual aspect that makes it directly comparable with the values cherished by religion.

Our guiding thesis, expanded slightly and put in other terms, is that if after we have gained some discipline in scientific procedure and have allowed ourselves to share unreservedly the purpose we find informing it, we retire a bit after the manner of the philosopher and muse on the nature of the values achieved in relation to the other ends of human life, we shall become confident that one penetrates to the heart of the meaning of science only when the attitude that underlies its method and finds peculiar satisfaction in its results is thoroughly understood and combined in whatever manner turns out to be required with the other attitudes that condition mod-

ern life. It may be that the human importance of science in the end lies in the moral ideal it reflects, in the kind of transformation that tends to follow in human character whenever the fundamental attitudes embodied in scientific research are adopted by an individual or community. Scientists themselves, while revealing these attitudes in their work, are apt to be blind to them for the same reason that all of us are unconscious of what we most pervasively and intimately are; they live them, but do not find it necessary for the purpose of their work to know them. Here is precisely the kind of opportunity welcomed by students of philosophy, for if philosophy can make any contribution of value to human life it is by virtue of the fact that philosophers are eager to understand to the full such other intellectual enterprises as science, while at the same time remaining sufficiently aloof from them to avoid blindness to their controlling motivations. The philosopher is a specialist in cutting corners; he wants if possible to catch the gist of what it is to be a scientist without being one himself. Thus he may acquire a vantage point from which to survey the changes going on in an age of science and see clearly how the values at work in the scientist's thinking are related in social growth to the values revealed in other great but different enterprises, such as art, religion, and practical statesmanship. Whether the results attained by this parasitic procedure meet real human needs or not is of course for others than philoso-

phers to say. Our leading questions, put in yet a third way, are something like these: Is there a definitely describable attitude toward life and the world that tends to follow when one has woven his controlling interests into a unity under the dominance of the scientific spirit? If so, what sort of attitude is it and of what scope and authority? What are likely to be the consequences of its continued impact upon other interests that persist in modern life, and what is a wise response to that impact? If we are to speak of the corollaries of modern science for religion, then, we shall mean the consequences of this attitude in whatever transformation it tends to bring about in our convictions with respect to such a subject.

The responsibility which these remarks lay is obvious. We must describe clearly the human need which it is the task of science to attempt to satisfy. And in the light of this need we must ransack more concretely what has been spoken of as the value of science, with special reference to the spiritual ideal reflected and promoted by its procedure—and we must show what is thereby involved for the values expressed in other great enterprises such as religion.

But many readers may be ruffled by this entire approach; it may seem queer to the point of absurdity. What vague talk, this, about the purpose of science, of science as pregnant with spiritual value! Science deals with matters of concrete fact, with laws explaining them; the realm of values belongs

to morals and religion. So many will caustically feel. Before we plunge into detailed exposition, then, may we gain preliminary historical support for the plausibility of our thesis from considerations suggested by the phrase *age of science?*

Presumably no one will seriously question the right so frequently exercised of describing our day by this phrase. To be sure, science is not the only claimant of such a uniquely descriptive position in the modern world. With equal historical justification, perhaps, we might speak of the age of democracy, of the age of capitalism, or of the age of nationalism. Without attempting to argue the relative merits of these phrases, it remains that if the phrase *age of science* is pertinent at all we are bidden to rove amid other ages, now become past history, in order to see whether we are likely to be right in the assumption that the vital meaning of any institution which can be intelligibly used in such a phrase is to be sought in a characteristic ideal that has been gradually if subterraneously blossoming, a distinctive feeling and conviction as to what is of fundamental value in meeting the needs of life. Let us consider two parallels.

The extreme popularity in the late ancient and early mediæval period, in the western world, of mysticism and of all practices that contribute to mystic attainment, even carried to the extreme of hermitry in a surprising number of cases, has given many writers a descriptive phrase for the age in

question. Now is this interesting phenomenon adequately explained unless we come to appreciate the ideal of life and destiny that is being pursued, whether consciously or no, by those who commit themselves to this mystic endeavor? Hardly. In all ordinary uses of the term natural it surely betokens unnatural spleen to turn one's back on the practical activities of everyday life and the companionship of society for the sake of some good to be earned by renouncing them. Only when we peer into the historical changes which conditioned the appearance of such an ideal does the phenomenon seem intelligible, but given the appearance of a purpose which would normally express itself in this way and the trend of the entire age opens readily before us. A time had come in the vast expansion and shocking degeneration of the Roman Empire when the normal activities of social life which earlier had led to their appropriate satisfactions no longer did so. Every institution that the ancient world had built up for the sake of nourishing normal motivations of conduct and of reaping their promised rewards seemed to have lost hope and potency. The world that man was naturally familiar with, the world of ordinary practical and social life, was running amuck, and earnest men could no longer honestly hope that anything worth while could be done with it.

But human nature, particularly in its exuberant reaches of imagination and emotion, is almost inexhaustibly fertile. Conceptions had already been

burnished up, by oriental peoples who had never been able to accomplish much on the stage of this world's drama, of another kind of good whose satisfaction was independent of the fortuitous play of success or frustration in the exercise of man's primary impulses. For such a faith there was another world, an inner realm of the spirit, possessing an eternal stability, promising an enduring intensity of exaltation that far transcended the transitory pleasures of natural impulse, and this world could be discovered and entered by any man who would surrender the things of the flesh for the sake of that blessed attainment. The discovery was to be made, in fact, simply by retiring to the recesses of one's own individuality, where isolated from nature and society one might contemplate the entire realm of being as caught up and held fast in the power of an eternal good. For the fullest realization, of course, severe sacrifices had to be made and the way of mystic discipline was hard, none the less the independence of the ideal and of the method of its attainment from the ordinary processes of life was clear. Now in a day when other goals had become sickeningly futile and the disappointed aspiration of the western world was casting about for a more dependable point of attachment, is there any wonder that a vision of character and an ideal of destiny such as the age of mysticism reveals became widespread and controlled the conduct of large numbers of men?

Again, if for another parallel we come down to

that brilliant period of mediæval life which begins with a cautious revival of intellectual interest in the late eleventh century and comes to full flower in the thirteenth, do we not find on examination that the transformation reflects a widespread change in the controlling ideals of the time and that its significance is most fully disclosed when we appreciate the nature of these novel visions of what is worth while?

The mind of northern Europe, slowly creeping toward maturity under the tutelage of the church, came to the point where it was no longer content simply to recite its lessons from the ancient text. It had to think about them on its own account and in its own way, not at first to question their truth, of course—it was too diffident and feeble in critical power for that—but to make their meaning real in terms of its own experience and its own inherent ways of thinking. It was the age of faith seeking to understand and justify itself by reason. St. Anselm, in his *Proslogion* and *Cur Deus Homo* especially, gives limpid expression to the temper of this type of speculation. "Credo," he says, "ut intellegam." Faith is ultimate of course, faith in the reality of God and the truth of Christ's vicarious atonement, but the goal of faith, the larger attainment for the sake of which faith has its value, is faith's self-justification through clear understanding of her object. The whole temper of the resulting movement in philosophy is pithily put by Professor

Woodbridge when he speaks of "philosophizing on your knees." We believe in order that we may know what it is we believe and why our faith in it is justified.

The ideal of blind faith then—of Tertullian's *credo quia absurdum,* flinging spiteful defiance in the face of reason—lost the supreme value which it earlier had maintained. In the course of the necessary growth to clear self-consciousness of the mind of modern Europe, that ideal was seen to involve an inner contradiction. Mere faith is not sufficient unto itself, it has an end to attain. That end is for faith to become seasoned with intelligence. Accordingly, a transformed ideal, the ideal of a reflective faith, normally arises. A praiseworthy character is now envisioned as one acquainted with the rational grounds of its conviction rather than as one convinced without insight, and in this transformation we have the essential *motif* of the age that lies in the offing.

What has been illustrated by these two examples is after all but a familiar doctrine of historiography, namely that the most judicious clues to the history of any complex course of human affairs are to be found in the ends most deeply prized and zealously pursued by the leading spirits who stamped their mark upon the time.

If our own is in any true sense the age of science, then, we are encouraged to expect that its real significance is to be found in nothing short of a novel

ideal of human character, of what is most highly to be prized in satisfying the needs of life and most wisely pursued as a justifiably controlling value. But the nature of these historical illustrations leads to a further important preliminary question before we embark upon our main task of analyzing the nature of the scientific ideal and considering its relation to religion.

Most of us would concede that these historic ideals just described have passed the peak of their influence and are on the wane. And yet there was a time when they were potent forces indeed in the shaping of occidental life. Why have they failed? What is there about them which forbade men in any enduring way to unify character and experience around them?

Well, it is fairly evident that the mystic ideal is one which cannot be adhered to with full consistency. To escape from the world of commonsense action is really possible only by committing suicide, which the mystic does not quite want to do, for the suspicion lurks that being alive may be a necessary condition of his ecstatic joys. But being alive involves some attention to the practical affairs which form the fundamental concerns of the rest of us; Stylites on his pillar had to eat, drink, and take care of the minimum requisites of bodily cleanliness. Even a mystic must be neither too starved nor bilious. Now this involves a certain inconsistency with his controlling ideal, for not only does it mean that his

transcendental absorptions have to be broken from time to time while these quite mundane matters are in the foreground of attention, but it means that other needs and impulses than his dominant one have to be continually fostered, with the consequent inevitability of temptations that he would like to consign to oblivion, such as the temptation to gluttony and to sexual satisfaction. Moreover, this inconsistency is not the only nor the most serious one. There is a social inconsistency as well, which by reason of the fact that the tendency of the mystic experience itself is to elevate thought beyond temporary or selfish objects of desire and attach it to more universal concerns, inherently frustrates the attainment of true unity of character around the mystic purpose. For if the mystic continues to live, in however meagre a fashion, he will be availing himself of the products of the economic activity of others. Now if all these others were to be converted to his goal its pursuit would become quite impossible for all except in the very mild fashion of the farmer-friars, for there would be neither food nor raiment with which to keep any of them alive. But if the mystic really believes his way of life to have essential validity he must regard it as relevant to others as well as to himself, and he cannot rest quite content as an unblushing imperialist who pursues his personal salvation at the cost of helping deny it to his neighbors. Yet further, because of the

impartial point of view which the mystic vision tends to develop, he will find his own thrills losing their zest when he considers and laments the fact that other people are too wayward to know how to pursue them. He will be moved to spend a large part of his time preaching the gospel of salvation instead of practising it himself, thus mutely testifying to an ineradicable competition in his soul between his avowed ideal and another, that of responsibility to a social good transcending any individual achievement whatever its solitary appeal. The point need not be elaborated further; our concern is simply to establish the fact that because of the fundamental conditions under which human existence must be carried on, the ideal of flight into another world of values than those of ordinary sense-experience cannot really maintain itself unpoisoned. Thus no matter how eagerly one age or another may commit itself to this notion of what is most worth while, a return will eventually have to be made to other controlling purposes if it still seem desirable to live at all.

In like fashion, the ideal of an age seeking rational justification for its accepted faith proved an impossible foundation of a stable character, because the questioning tendency which drives faith on to this search for reasons cannot stop short at any designated point. To solve the difficulties it raises it must perforce proceed to raise more serious ones,

until in the end the very basic assumptions on which the whole structure of faith rests are involved in uncertainty and ruin.

Innocent enough seems the beginning of the process. It is but an obedient response to the injunction of St. Paul to "give a reason for the faith that is in you"; that God exists, for example, is accepted as certain, but it is important to see why belief in his existence is justified. Suppose now that in some who are encouraged to engage in this enquiry a thoroughly satisfactory reason does not appear; the tragic evils of life, let us say, seem not to be consistent with theism by any considerations that reason is able to glean. What then is to be done? Shall we still believe, and say that such divine subjects transcend the powers of human reason but are still to be intelligently believed on the ground of revealed authority? Such was the attempted position of many in the age that followed that of Anselm and Aquinas.

But this attempt oozed with contradiction. For the assumption with which the age began was that it is important to seek a reason, but if the reason cannot be found the seeking becomes irrational and the foundations of all faith are jeopardized anew. And continued belief where one cannot see a reason becomes difficult on other grounds. It is conditioned on an implicit conviction that the proffered revelation from the past really is authentic. But suppose in some troubled soul this conviction grows heavy

with doubt? Are the proofs of the unique divinity of the Scriptures adequate? This leads in time to critical questioning as to the very nature of proof and the ultimate criterion of truth, and once such a basic question as this is clearly raised no answer in terms of faith in external authority can possibly command assent. The very raising of such a question means that some mind has become conscious of the live process of thinking going on within it. Now for such a mind truth can never mean anything other than what satisfies that live thinking, revelations from the past as far as they are verified in contemporary experience, but not possibly so far as they fail to gain such present verification. The ball of thinking, once set rolling, increases of its own momentum like a snowball on a hillside, and the ideal of faith seeking intelligent justification inevitably leads on to other ideals which avoid at least some elements of the contradiction that yields the secret of its dissolution.

Now is the ideal of science more securely grounded in human nature and the essential conditions of human existence than such ideals of past ages as we have been exemplifying? Are there definite and important ways open to impartial examination, that show certain basic inadequacies in dominating ideals of the past to be remedied by the scientific spirit, and thus justify the conclusion that what we are calling the ideal of science is more inherently stable and offers a more dependable foun-

dation for a unified character than any preceding ideal of influence?

The succeeding chapters must offer what justification I can give for an affirmative answer to this question. But before this introductory discussion is closed our general foundation must be laid, on which what follows may be built. That foundation is found in the fact that in a specific sense the need which the enterprise of science satisfies is more fundamental than any other human need. If we agree to this it will not be so difficult to defend the further conviction that the controlling attitudes of scientific research must occupy a central and hence determinative place in any unification of life and character which can be carried through consistently, not only in an age such as ours but in any age in which human nature and its environing conditions remain essentially the same.

Why is the need which science seeks to meet more fundamental than any other? Because, in brief, the aim of science is to establish dependable knowledge of the relations of things, and such dependable knowledge is needed in the effort to satisfy any other need. By a need we mean a persistent desire for some object that cannot always be grasped at once when the desire happens to occur. Now if it cannot be grasped at once then some intermediate conditions must be satisfied which will bring the object within reach; to take very simple examples, if blueberries are wanted then we must walk to the

hillside where they grow and pick them, or to the store and purchase them; if we want to graduate from college we must pass the courses which the college requires for the conferring of its diploma. In either case, and this is true of every need, for dependable satisfaction we need knowledge of some relation or relations between two events, such that we can say with assurance: If I do *a* (which is within my reach), I can trust *b* (which is not now within my reach) to appear, or (in case we want to avoid it) to be prevented from appearing.

But if we do not unduly limit our conception of need or of what we mean by such simple words as "do" and "reach," the whole purpose of science is exhausted in the effort to establish such regular and exact relations. As an institution it is born with the loose and scattered "sayings," thrown off on hardly more than casual observation, that still sprawl untouched in primitive languages. These sayings vividly reveal the intensely practical motives which underlie scientific enquiry by the imperative form in which they are usually cast: Make hay while the sun shines—nothing venture, nothing have. As science transforms these into the imposing form that the great laws of nature reveal today it is doing nothing more than expand these primitive statements of relation greatly in number, make them consistent with each other by discovering dependable conditions of the exceptions to them, and render them more unified and exact by weaving them in

systematic quantitative form wherever possible. And its method in doing all this, as we shall later see, is nothing other than the method which the very nature of our thinking forces all of us to use when we seek to explain a puzzling event engaging our attention, only the method become self-conscious rather than blind and thus able to develop actively its necessary technique and its instrumental aids.

Of course when leisure and a highly developed intelligence appear, the practical pressure which first enforced the analysis of nature into dependable relations may fall into the background in cultivated minds; men acquire an interest in the discovery of regular relations without conscious regard to the question whether either term of the relation is within reach of their active manipulations. They note that the planets move in seemly curves, which they meticulously chart, without being able to do much further about the matter; they create pure mathematics, for the sheer joy of revelling in otherwise useless relations. So far as our guiding thesis is concerned, this only means that the ulterior needs which science satisfies have in these men become indirect, and that a direct need has come to be felt in the discovery of regular relations themselves; an esthetic joy in the order disclosed by science quite apart from its possible applications. But that such should exist testifies to the enormous underlying practical demand for the dependability of this order. If we did not use knowledge of the regularity

of nature to meet the needs of life, the esthetic raptures which it also satisfies would be foamy and shortlived. For we cannot at once seize everything we need for the maintenance of life, and there is no evidence of rapture in the dead.

If there is then a definite attitude or ideal expressed in the development of this curious procedure of science, we may expect it to be, in the sense just outlined, a value fundamental to all other values. That there are other values, such as those which religion endeavors to meet, is axiomatic. That they have some constructive function in life and are hence not to be quenched entirely, would also appear axiomatic. Certainly it seems at first sight that even a scientist, when he quits his laboratory and participates in a religious service which clarifies his vision of things worth while and invigorates his emotional attachment to them, is doing something not easily describable by any scientific term and something of legitimate value for life. But if the ideal of science is fundamental, then it will inevitably play a dominant rôle in character when it has been fully understood and realized in its appropriate relation to other valid ideals. It will form the core of the harmonious personality thus established; it will rightly demand that they become pruned in conformity with its requirements in whatever conflicts between them have arisen. It may be that in an age of science changes in our mental temper such as this portrayal suggests are actually,

if slowly, transpiring; that even in those who seemingly accept the authority of science only in the fashion of external appropriation of results there is working a leaven intimately connected with the fact that we are living in a scientific age. If so, it is surely important for us to note consciously what is going on within us unconsciously, to glimpse the goal it is tending toward in whatever pressure it exerts on the miscellaneous range of our habits and feelings. When we see clearly what kind of people science is making out of us who are subject to its influence, and estimate what to expect with regard to the scope and power of this influence, we shall find ourselves at the heart of the knotty problem of the conflict between religion and science, and in our hands the tool to unravel it.

Whether and how we may proceed to this broader conclusion, what it means in its larger details, and what we may wisely do about it, is the question which the analysis in the following chapters attempts to answer.

Chapter II

THE NOTION OF UNIVERSAL LAW

In this and the two succeeding chapters we shall examine those aspects of scientific procedure which reveal most prominently what we have called the ideal of science, the interest or attitude reflected in its task of meeting the need above described and the way in which the task is done. We may begin with the assertion of the preceding pages that the whole purpose of science is to establish dependable, that is, regular relations between things. Brooding upon this idea of a regular relation, we find ourselves face to face with the notion of scientific law. It will pay us to devote some time to a historical and critical exploration of the human meaning of this phrase.

We are all familiar today with two uses of the word law. In one use, and this is the most primitive, spontaneous, and inevitable meaning, it stands for what we are thinking about when we have judges, legislatures, and policemen in mind. This is the regulative meaning of the term. When we utter it we refer to an enactment enforced by some social group over its individual members, or by a deity over the

consciences of his followers. It may, under the stress of metaphysical sophistication, be rarefied into an imperative of moral obligation independent of religious or social backing, as in the philosophy of Kant, but the common element in all these uses is the notion of a discoverable and authoritative command which certain individuals are bound to obey. Since no social group could well become conscious of its essential activities without pressing this conception into the forefront of attention it is evident that this meaning is basic. And indeed a considerable part of the world has never transcended it, namely all those whose primary notion of a law of nature is that of a more or less arbitrary enactment of a divine will. For such thinking all law is in the end of the sort just described.

The other use is one which we are familiar with in its relation to scientific enquiry. In this use of the term law we are not thinking of a regulative, but merely factual affair; it is not something prescriptive, but descriptive. It has lifted itself to independence of any necessary complication with the imposing of obligations. It is the result of an attempt simply to state the outcome of careful study of how nature behaves in general terms, so that when this or that feature of her behavior recurs it may be identified, understood, and its yet potential phases confidently predicted. There is in it no element of how things ought to act, but simply an objective statement of how they do act.

This distinction need hardly be belabored to modern folk but the point which I wish to emphasize in connection with it is that this second notion, however simple it seems to us, represents a very difficult human achievement, and can be appreciated in anything like its full significance only when we study its tortuous historical growth. For our thinking is naturally shaped by social habit and is primarily concerned with the adaptation of means to ends that are pursued in a matrix of social relations. The conception of a universal descriptive law is very remote from this spontaneous character of human reflection, while that of a legislative enactment is much more congenial and is demanded by the simplest social tie.

Shall we consider more fully the differences and similarities between the scientific notion of natural law and its main historic predecessors and still influential competitors? Our quaintly personalistic mode of viewing the world has already been noted; it is but a general extension of the principles of interpretation which at once prove themselves fruitful when we try to describe what happens in the complex relations of persons within a social group. Such relations are pretty obviously determined in the main by more or less unpredictable impulses controlled to some extent by conscious realization of their probable consequences. It is in the attempt to extend this control in definite ways conditioned by prevalent conceptions of social welfare that laws

in the political sense of the term become reflectively formulated. Now what is often spoken of as the religious view of nature results when this mode of interpretation is followed through without any question as to its legitimacy or its limits. Why did *b* happen when *a* happened? The answer offered by this procedure consists in an appeal to an arbitrary purpose affirmed by some invisible being who controls all or a certain realm of natural events and whose will therefore constitutes an ultimate principle of explanation. The things composing the world spring into place, in Santayana's vivid summary of the first chapters of Genesis, in response to the fiat of a vehement Jehovah swimming about in a chaos.[1]

Many of us today have so far outgrown this attitude toward nature that it seems thoroughly fantastic, though it is important to remember that the thinking of most of the world is still dominated by it, and that its psycho-sociological origin is so naïve and inevitable that nothing else could easily be tried as man's first serious attempt to order his world in some systematic way. Moreover, we mistake greatly if we suppose that the notion of law in modern science bears now no traces of this animistic and theological beginning—how far it does so we shall try to see—for the conception of universal law that might be worked out by an age with no animism behind its thinking we can hardly even surmise.

[1] George Santayana: *Reason in Science,* p. 14.

I suppose this animistic interpretation can be scrutinized most successfully where the polytheism that is congenial to it has not yet been superseded by a clearly monotheistic religion. The latter is likely to offer what is really a halfway stage toward a very different view, for if everything happens as a result of the choice of a single deity who is supposed to have anything like a continuous intelligent purpose, the world of nature gains a certain concatenation which foreshadows the fully rational order postulated by science, even though the conception of arbitrary will be not quite eliminated. But when polytheism is quite rampant and unabashed, every tree having its dryad and every brook its naiad, or at least when every distinctive realm of events is superintended by its appropriate deity, such as the sea by Neptune, war by Mars, love by Cupid, then both the appealing beauty and the intellectual barrenness of the whole mode of interpretation become startlingly clear.

The beauty of the attitude lies in the luxuriant fashion in which the conception lent itself to poetic response. We may be misled into exaggeration of this phase of polytheism by the form taken by it with which we are most familiar, that among the ancient Greeks, whose picture of the world was really that of a living drama staged by a heterogeneous collection of deities cleverer but no better than ourselves and who often knew as little as we do what was coming next. The manner in which

this picture challenged artistic creation in literature, sculpture, and the other arts is too familiar to need more than reference. To men whose imaginations were thus governed even a lonely walk through the woods must have been either a very appealing or quite terrifying exploit of social and religious adventure. It is no wonder that in modern times, especially after a superheated period of rationalism, men of romantic proclivities have longed for a return to this warmly personal and invitingly esthetic way of viewing nature's behavior.

What is the essential weakness in this interpretation? To answer this question it is hardly enough to say that the facts did not bear it out. In many respects they did bear it out, at least the needs which men wanted to satisfy in their explanations were sufficiently satisfied by it for the view to persist for many centuries in practically all parts of the world and to offer pungent resistance even today to replacement by what we regard as more verifiable conceptions. The fundamental answer in my judgment is rather that a practical technique of control in terms of this attitude could never be really devised with assurance, so that what we regard as real understanding and power of prediction in dealing with nature was not actually secured. If events determining the weal or woe of men, such as the maturing of crops, victory over enemies, the subsidence of a plague, are caused by the will of invisible beings, how shall we go about it to turn these voli-

tions in favorable directions and avoid the crushing calamities that might otherwise befall? The answer given and the technique attempted are wholly consistent. Since other people's volitions are affected by beseeching and by treasured gifts, those of the deities are supposed to be similarly modifiable. Hence the remarkably systematic and often terribly pathetic development in the history of religion of the institutions of prayer and sacrifice. In its extreme form, human sacrifice, what a mute testimony to man's dire need of finding some way to avoid social calamity and assure the blessings of life!

Now it is evident at the start that the power of prediction and of control that might be secured in this way is but partial. For beseeching is often without avail, and one moved by ferocious anger may not be appeased by any gift that can be brought, however precious. Hence there is a certain intrinsic awkwardness in this manner of approaching the task of understanding nature that would surely lead to the consideration of other fundamental hypotheses when it became clearly recognized. But in the light of actual practice the success of the technique proved to be constantly less than even this limitation would appear to justify. The behavior of the gods was not of course supposed to be merely capricious, or it would have been useless to attempt to affect it at all. Now this means that there is present the assumption of some dependability in what they do, an expectation felt to be legitimate that

the sacrifice accepted on this occasion will avail equally when a similar occasion recurs. Otherwise no technique would have promise or value. But as reflection worked itself free from the emotions of fear and reverence it was forced to acknowledge that no such regularity in the behavior of the gods could honestly be verified. Their purpose was inscrutable, their ways of dealing with men past finding out. Even the most meticulous performance of the sacrifices which had been commanded, and the most fervent prayers which revelation had promised would be sure to reach the throne of grace, often bore no fruit.

As this lesson came to be learned, thinking moved inevitably in two different directions. With those in whom religious fervor ran high a profound element of satisfaction came to be found in submissive acceptance of this inherent mystery of the world, of the unpredictable power of divinity—the Lord gave, and the Lord hath taken away; blessed be the name of the Lord!—accompanied by a theological rationalization of the failure of the attempted technique of nature-mastery. With the consoling cadences of this rationalization we are all familiar. If the sacrifice is of no avail or the prayer brings no answer, still well and good, so runs the reverent apology—your faith did not prove strong enough, or God's will was other than yours, and of course it is better for his will to be done than for your contrary desire to be satisfied. The glory of this

conception was that it fostered under the appealing imagery of a humble acceptance of God's will the important virtue of resignation to forces too strong for us to master. But this virtue should not blind us to the element of intellectual and practical defeat in the whole procedure which came to be at least partially remedied by the more successful technique of science.

Experience, then, did not really support even those scraps of dependability which seemed to be justified by this theological way of thinking, and which God apparently had guaranteed by his solemn promise in written revelation that if men did thus and so in matters of ritual and ceremony, specific consequences could be counted on in terms of human welfare. The promise could continue to be believed therefore only where loyal religious zeal supported our natural tendency to notice the favorable instances of any relation we suppose to be regular and forget or explain away on other grounds the negative ones.

Man cannot really rest content in any point of view which sees in the world merely a collection of arbitrary events, produced by a being or group of beings whose conduct is a succession of impulses only partially ordered by intelligence. By this route the world cannot really be made a predictable order, and because we need such a predictable order so absolutely for the conduct of life the disappointments encountered in following this line of attack

sooner or later encourage some bold thinkers to try a different approach—to look persistently for regular connections between the events we are interested in and other events which are obviously amenable to modification by our powers. With enquiry guided by such a purpose as this science takes its rise.

But there has been historically another important competitor of both animism and science, perhaps not as widespread or enticing as the former, and evidently presupposing it in time, for it bears the marks of the disillusionment which animism inevitably prepares. This is the conception which is best represented by the word *fate,* and which has not only played a considerable part in oriental thinking but is found affecting a sporadic intellectual current in Greece and Rome. We are familiar with those episodes of Greek hero-story which deal with the supposed duty of blood-revenge, such as the story of Orestes. Here an initial crime sets in motion a chain of events, each absolutely necessary because of the unquestioned duty of avenging one's kin, but perfectly hopeless in its outcome and weighted with insoluble contradictions. In theory Orestes ought to be killed too, but there is no one left whose duty it is to wreak on him the necessary vengeance. Here the arbitrariness of the animistic conception is given up, but the hope of understanding and control, which was a persistent if futile factor in the same notion, is given up too. The world is viewed as a chain of necessary events, but the necessity that rules them

is blind, inexorable, unmasterable, and so from the point of view of human interest in understanding the world utterly hopeless.

Despite the stark futility of this gloomy picture of the world, there is an august impersonalism about it that is not without kinship with the intelligible order postulated by science, and many oriental conceptions of the deity, notably in India, show that it is not incapable of arousing feelings of reverence and adoration. The infinite Brahma dilating all things and from which they flow in unalterable necessity is far more like the Greek fate in these decisive respects than the Jewish Jehovah, yet it has served as an object of worship to many times the adherents of the latter deity.

Words need not be elaborated to show why this doctrine does not satisfy the main needs which express themselves in the enterprise of science. For the theoretical interest in detailed understanding it gives nothing but a barren desert, because accounting in the same terms for everything that happens it yields no insight into their differences from each other; as to why *b* follows *a* rather than *c* or *d,* it has no explanation. All it is concerned to affirm with its rhythmic invocation is that each of these occurrences flows from the same absolute, inscrutable origin. And of course the practical interest of science in establishing human control over nature through discovering regular connections between things beyond our power and things within is not even pres-

ent here; the fateful chain is from first to last beyond all possibility of interruption or effective manipulation. To a man of ambition and hope this doctrine makes the universe lapse into a somber scene of unmitigated boredom.

It is really an astounding thing to have reached in any widespread fashion the notion that Professor Whitehead calls the instinctive faith of science and which has deeply permeated the attitude of all intelligent modern folk toward nature, namely, the notion of the world as a system of *universal law,* which means, as we shall see, that it is pictured as intrinsically responsive to the effort of intelligence, impartially exerted in the interest of social control.

Historically, we owe this notion to the Greek philosophers who first managed to free the idea of law from its theological and political complications, so that it became a rationally discoverable principle of unity behind processes of change, entirely superior in its validity to the enactments of both gods and men. But these speculative Greeks, like all philosophers, formed a meagre, queer and ineffective class; they would not have been able to make such a conception foundational to the thinking of large masses of men had it not proved possible, in the great mediæval era of Anselm and Aquinas already referred to, to combine what was essential in it with the Hebrew notion of divine law. This latter idea, beginning in quite unpromising form, was extended to universality in the thought of the great prophets,

so that it was conceived to apply in the same way to all men, whether Jews or Gentiles, and was also believed to respond to intelligent discovery in the scriptures' revelation. What the great mediæval philosophers who inherited both traditions came to believe in accordingly, was a personal deity whose ways were yet as thoroughly rational as a Greek philosopher would have wished them to be, and were accordingly to be hopefully discovered by men and reduced to intelligent formulation. Here was a notion that men generally could come to share, and although crippling complications still infected the picture and had to be purged before the whole faith of science clearly emerged, at least the essential thought of a world inherently responsive to intelligent understanding was there as a settled belief to which it might appeal and a nourishing soil in which it might grow.

Just what was the purging yet needed? What baggage was to be left behind? We shall see what this was when we note that the Christian conception of God was that of a being morally perfect as well as rational. Accordingly, as long as the interpretation of the world was attempted in theological terms the presupposition could hardly be avoided that everything must happen for the sake of some good, and that this circumstance ought to furnish a helpful guiding clue in the investigation of nature. If we remember the persistent power of this notion in the biological sciences, even after the Darwinian theory

had become generally adopted, in the form of the assumption that every organ has a definite use for the organism, we may glimpse what the state of science generally must have been when the same type of assumption was taken for granted everywhere. Hence, while practically all the early champions of modern science still believed in God, they were strongly concerned to rid their scientific method of moral notions. The usual way of justifying this was to say that while God has a purpose in everything that happens his purposes are often beyond finite comprehension and should therefore not be considered in any attempt to formulate human knowledge about the affairs in question. The important thing then is to discover, by careful observation and experiment, exactly what is happening in the behavior of nature without confusing our minds with the necessity of a moral apology for it. There was of course much cant in this song; but the underlying point was irrefragable. In the Aristotelian language of the times, this meant a polemic, engaged in more or less fiercely by all of these pioneers of science, against the introduction of "final causes" in the field of physics, final causes referring to the good ends for the sake of which events were supposed to take place and in terms of which they were in part to be explained.

But of course this purging of final causes from natural science did not mean that all presuppositions congenial to the theological view were eliminated.

Jewish-Christian theology and the philosophy of religion of the great Greek thinkers had left a very basic mark on the new scientific conception, which constituted precisely its major difference from the notion of fate in oriental thinking. This mark is found in the belief that there is an intrinsic community between the structure of the world and the active intelligence of man which renders the former intelligibly responsive to the effort of the latter, and thus in some sense holds it to exist for the sake of being known by human reason and of yielding the rewards of knowledge in the shape of lucid contemplation and confident control. Thus however far the scientific faith in an intelligible order of nature has departed from the gusto in the miraculous which is so strong an element in our traditional religious thinking, it yet grew upon and still maintains a foundation which apart from the history of western theology would be quite inexplicable. Had it not been for the permeation of western thinking by the theological forerunner of this faith, it is difficult to suppose that enough keen minds would be willing to apply it in concrete investigations long enough for their cooperative efforts to achieve anything promising enough to build upon. It takes time for scientific research to produce sufficiently rewarding results to justify the continuance of such monumental labors on the strength of their own authentic fruits. With just as great intellectual keenness as that boasted by modern Europe ancient Greece did

not produce science, nor did the great currents of oriental thinking, in China, India, or Egypt. It is hardly an accident that the age of science was born of Christian faith in a dependable God, fertilized by the rationalism of Greek philosophy.

But while to bag the goose is good, to roast it around the fire is better. These historical preliminaries, while of interest in themselves, have their main value in preparing the way for a critical consideration of this faith of science. Just what does it mean, as a psychological and moral achievement, for a considerable part of the western world to have made implicitly its own this notion of nature as an intelligible order, as inherently responsive to human understanding by reason of its essential explicability in terms of universal law? What consequences is this notion gradually effecting in the character of us moderns so far as we are subject to its influence?

The notion of universal law is fundamentally twofold in its human bearings.

In the first place, mastery of such an idea testifies to a cleancut emancipation in our thinking from the control of the immediate present. In the old Roman phrase, law is that which obtains "semper, ubique, et ab omnibus," and such simple everyday terms as regularity, dependability, and the like, presuppose clear grasp of such an ideal of universality. These words would be meaningless ink apart from the conception of chains of identifiable recurrences such that given a certain event another is inevitably

connected with it, and of certain persistent conditions which remain the same amid all variations of their associates. Our very language reflects this achievement, so that it is impossible to describe it other than in its own terms. We assume a dependable relation between words and the things for which they stand.

Now in a general way, of course, this achievement cannot be laid uniquely to the credit of modern times; ancient philosophy must have been in possession of the principle, and proverbs of all peoples seem in some sense to presuppose it. Yet there is a vast difference between the self-conscious, daring, unlimited conviction of an intelligible order which the modern scientist reveals, and the frail, half-hearted beliefs which preceded him. We shall see something of the difference if we devote a casual examination to the remarks on the point offered by the greatest mind among the Greeks. Aristotle insists upon the commonsense distinction between "that which happens always, or for the most part" and connections which are merely fortuitous. The latter relations are taken to be just as objectively real as the former, and it never seems to have occurred to him to make seriously the postulate that these fortuitous concomitants can be reduced by analytic observation and experimental manipulation to disclosures of underlying relations universal in scope. Thus nature for his controlling theory was but partially ordered, only loosely intelligible. The

boldness of the faith of modern science lies precisely in the fact that it insists on an ideal of intelligibility that spurns all limitations; for its implicit conviction there is absolutely nothing in nature, however capricious to ordinary observation, that is not at bottom reducible to universality of law. Every relation is regular if we but penetrate to its determining conditions.

This certainly implies a remarkable mental attainment. Primitive thinking, as anthropology readily reveals and child psychology as easily confirms, is largely confined to immediate particulars of sensation and action, and even where universality is implicit the fact is not consciously recognized and the uniformities exist merely as rules of thumb, not as genuine scientific laws. By saying that it is confined to immediate particulars I mean that it is occupied with selecting means to a specific end, now challenging, and the question whether the means thus selected can be counted on to serve in other situations does not rise to the foreground, as it does wherever attention has been seasoned by the conviction of science. By saying that its discoveries are rules of thumb rather than scientific laws I mean that they are practically successful when used by those who have mastered the lessons precipitated in them, but are not formulated in such a way that real universality of application in appropriate situations is guaranteed. At best they are like the recipes of a cook who can usually be counted on for a good

dish but who cannot tell anybody else just how to produce it. The thinking of this stage of development is thus characterized by devotion to a succession of specific ends, no larger generality of purpose having definitely emerged, nor its intellectual basis clearly grasped.

To leap to the unlimited conviction of order held by modern science and to regard any apparent accident as a challenge to the discovery of regular relations hidden within it, testifies to a profound achievement in our modern psychology. And on the moral side this clear recognition of the meaning of strict universality as well as the active commitment to its application implies the formation of a novel ideal of life and one more intelligently justifiable than any of the less far-reaching ideals that preceded it. What is this novel ideal, this distinctive conviction of what is important?

The core of it lies in the conviction that while it is often important to attain this or that specific end whose immediate appeal is potent, it is far more important to discover the dependable relations which must be respected in the pursuit of any end to which knowledge of those relations is relevant. If it is important to lower my bucket into the well this morning it is far more important, supposing that I can hope for success in doing so, to discover the essential laws of pulleys and levers, and thus bring all mechanical operations of the same type under human control. In passing from the first task

to the second my end has changed from something very specific to something rather general. It is no longer to get a bucket of water here and now; it is to vouchsafe information that will be of dependable aid to anybody in doing many different things which involve the same relations as hauling up a pail of water does. If we generalize still further from this illustration we reach a clear notion of the ideal of science with reference to its devotion to universal law.

The ideal of science is to establish what is needed for the successful attainment of any other ideal. If further repetition of a basic point in other terms is pardonable, we may put it in this form: the purpose of science is nothing other than human purpose itself become conscious of its universal needs. It is an interest in all other interests realizing itself as such and developing its appropriate feeling and technique. Scientific knowledge means hospitality to all human purposes, as furnishing the most dependable means possible for their prosecution, and accordingly the pursuit of scientific knowledge is the living expression of the conviction that such constructive hospitality to other goals is a more important goal than any of them taken by itself. In particular, the unique conviction of modern times that the accidental is not ultimate in the structure of things, means in terms of our controlling valuations the feeling that this completely universalized purpose is under all circumstances without exception

so supremely important that any bafflement which it meets must be regarded as temporary rather than final, any apparently stubborn element of chance really something that can be taken as a dependable means, not simply left as a disturbing token of nature's insanity.

It is because of this implicit character of science that we instinctively feel something monstrous and grotesque in certain situations which in an age still irrational politically occasionally present themselves to observation. I mean situations in which the energies of a group of scientists are commandeered by this or that government with the expectation of keeping the laws thus bought under lock and key and insuring their devotion to limited nationalistic ends. That such policies may succeed for a time and that under present conditions scientists must be forgiven for allowing their intrinsic universality of aim to be thus prostituted does not relieve the unblushing contradiction in such procedure; even patents expire in time. It is like attempting to compel an artist to produce a piece of sculpture that will seem beautiful only to the members of a certain club, or a logician to produce laws of thought that will only hold good for a term of years. Politicians may cry "America first," but the laws of science are impartial.

We shall reach a related result by another series of considerations. In discussing the above we have really anticipated a second fundamental achieve-

ment that the consciousness of universality of law and of its importance reflects. Universality has a social implication, conveyed by the last phrase of the Latin formula already adduced. Its mention may seem somewhat fantastic to those who conceive an age of science mainly in terms of the machines through which scientific knowledge is applied to the control of nature, but it must be remembered that behind this machine technology and rendering it possible is the research activity of pure science, with the characteristic attitudes and demands which the latter makes. It is in these demands that the true moral corollaries of science are to be found, for without them the more popularly visible achievements would not have existed and could not now endure. Universality not only means that which I can identify as a cord of unity running through a series of varying events, but that which can also be verified as such by other minds than my own. A universal law, that is, is one which can be corroborated in the same way and under the same conditions by my fellows, and which is stateable in language such as will throw it open to social testing, and make it available for use in the experience of others on the same terms as it becomes available for me. Apart from this it is almost impossible to accept it for myself as a genuine law. If it fails to meet such social corroboration when the outlined conditions are observed, I shall be more inclined to doubt my own senses and even my own sanity than

to continue to affirm it as universally valid in spite of the disagreement of my fellows. This means that science is by nature a social possession, utterly removed from the monopolizing spirit of greed and competition.

How far this social implication of universality really underlies the more abstract notions of generality, dependability, etc., is probably a question on which the guesses of competent students will differ. Considerable evidence could easily be adduced for the thesis that in practice, in the case of any growing individual, it is through the attainment of a socialized point of view that the limitations of our particular wants are always transcended, and that apart from social relations the possibility of consciously realizing an ideal of universality would be quite impossible. Compare the difficulty with which a spoiled child, brought up without brothers and sisters, outgrows the selfish ends which he has always taken for granted and appreciates how others view him, with the ready way in which impartiality of reference is attained by one whose family relations have always forced him to share a social judgment on his conduct. Universality is perhaps intrinsically a moral matter, dependent on getting outside of oneself and sharing the thinking of others.

At any rate the ideal of science, as shown by the fact that asserted laws must be susceptible of social verification and that scientists more and more recognize the essentially cooperative character of the

scientific undertaking, is a social ideal. Its existence testifies to the emergence in character of a kind of unselfishness more securely grounded than any other and outreaching any other in its generality. Of course I am not forgetting that the primary push of curiosity and ambition takes many forms and that accordingly much of the work of any given scientist may seem to be motivated by no such exalted spirit as this. Gentlemen prefer blondes, and scientists too have pet theories that appeal for no virtuous reason.

But simple curiosity or ambition as revealed in a child is one thing; the disciplined, emancipated, fully generalized curiosity of the true scientist and his eager enthusiasm for its satisfaction is another thing. In the broad difference between the two as shown in the way they act may we not detect the moulding influence of a socialized bent such as when quite matured and consciously recognized would take the suggested form? We restate our previous portrayal of the ideal of science so as to make central this social emphasis; to be scientific is to care more to establish values that can be universally embraced and used than those which are the objects of desire simply for an individual or limited group. Science reflects the attainment of a settled faith that it is more important to secure trustworthy means for realizing the ends of others than goods that can be monopolized by oneself. To be a scientist is to prize more the understanding and formulation of the conditions required for solving the problems of others than

the solution of any given problem of oneself; or rather, it is to make one's own guiding problem the general difficulty that is met when anybody attacks the solution of any problem.

Now such detachment from the immediate and the individual as is revealed in a transformation along these two lines, whether or not the reader agree that the ideal of universality implicit within it has been actually influential in schooling the character of scientists, is certainly the spiritual foundation of the realization of world unity or any other important social good. To prize what can stand the test of verification in human life at large more than what appeals to an individual or restricted group, to care more for the establishment of dependable means for the realization of any human good than for the realization of any particular good itself—this certainly manifests a kind of attitude and purpose far removed from the pettiness and blind folly that curse so many of the doings of men. Fanatical attachment to goods that must be divided rather than shared is the splenetic, seething source of war, jealousy, intrigue, and every form of exploitation and rivalry that yet blackens the surface of our planet. Of course, in no one is the achievement perfect. During the Great War scientists and philosophers too fell a prey to the all-engulfing wave of international hatred and devoted their thinking to goals which most would now admit to have been deceptive and vain. But human encouragement as

well as confirmation of our general thesis is to be found in the fact that in minds nourished by the scientific attitude these insidious temptations are soonest conquered. While the French armies were making the Ruhr the scene of intensified bitterness and animosity Einstein was received with honor among scientists of the allied countries, and the fact that he was a German did not appear to detract from the significance of his achievement or the friendliness of his welcome.

One point more and we must leave this theme of universality of law. How deeply grounded in the essential conditions of human life are these spiritual values which have been portrayed above as corollaries of scientific devotion to universal law? The answer, I think, is that their foundation is far firmer than that of any alternative. For, is not the purpose which we have been trying to show underlies this scientific faith in the world as an intelligible order a more definite concretion of the purpose which gradually comes to controlling power in the experience of all of us if we allow our ideals to expand to their normal limit in the fashion inevitably dictated by the buffetings of contact with nature and with other folks? If so, then we have found definite justification for the conviction that the scientific ideal of universality is more securely rooted than any contrasting ideal and in any stable harmonization of character must play a controlling part. But ponder the facts.

The purposes with which all of us begin our conscious experience are those determined by the instinctive activities of the race, redirected and expanded by the habitual ways of the group to which we belong. Just as we take without question the food that is put in our mouths and the clothes given us to wear, so as children we imbibe the staple ideas of our community and share without criticism its emotional tones. In short, we make our own at first the purposes that are taken for granted around us, for they constitute the necessary foundation of any conscious experience that is to be ours in the future. We cannot develop our mature minds out of nothing. And amid great variation of time and place these purposes always reveal a certain pervading similarity due to the fact that they are founded upon vital needs which all of humanity share.

Some remain substantially in this stage of control all their lives. They raise no serious question of the settled, traditional ideals. Either because their emotional attachment to them is unusually intense or because lack of originality makes the accustomed answers to any problem seem always the most plausible and issues in blindness to any problem really outreaching familiar assumptions, they never attain the point where any other purpose seems more commanding than the dominant purposes already accepted around them.

But if individual consciousness has grown live and confident, and imagination becomes freely fertile,

this stage will not continue to satisfy. Attention will be caught by phases of experience that cast doubt on the validity of current explanations, novel hypotheses will be boldly played with in imagination, and if they seem confirmed by observation will not be surrendered in reverent deference to the consecrated beliefs they violate. Now this is the intellectual phase of a process whose purposive aspect is creative novelty itself. We have an individual who no longer admits without question the current ends of action but dares to entertain and pursue some modification of them which his liver imagination has envisioned and his more critical observation has proved. Put in another way; he has not merely become conscious of himself as an eddy in the current of community life, but he has become self-conscious in a new way; he knows himself as a center of power that may oppose the community and convict it of error in its traditional conceptions of good. This is the stage of rebellion and of freedom. The individual who has reached this point refuses to be bound any longer by the goals his fellows count worthy of realization. He has discovered something different that appeals to him, and appeals so strongly, and finds justification in his experience so vividly, that the mighty call of loyalty to tradition cannot contain him. In the early development of social groups this stage was precarious and full of danger, for rebellion meant disunity, and disunity of any sort was highly prejudicial to community suc-

cess in the struggle for life. But as came enlarging experience of the important benefits to society of fostering a strain of originality, and as widening communication thrust people into appreciative interplay with groups whose standards of value were different (a process of transformation which has today gone very far in producing its inevitable consequences), manifestations of individual freedom are taken more lightly. In fact, throughout large areas of the modern world, notably those permeated by scientific interests or affected by the stress of business competition, such inventiveness is positively encouraged as an indispensable condition of social advance. The extent to which this is true may be realized if we compare methods of higher education in any primitive group or in mediæval society with those which prevail in any self-respecting university today. In the former the whole purpose of education is to instill in a growing generation the controlling ideas and ideals of the past, and any display of scepticism would be sure to arouse horror and repression. In the latter no teacher counts his work done unless along with communicating mastery of accumulated knowledge he has also stimulated the student to think for himself, to criticize freely the deposit of tradition, and to form the habit as well as entertain the ambition of contributing creatively to social growth. The last thing he wants in a pupil is a docile copy of his own intellectual frame.

But in describing free individuality in this fashion we are already presupposing that the second stage is destined, if intelligent growth continues, to pass into a third. For of course not all rebellion is socially constructive. In itself it is simply confident departure from prevailing purposes, commitment to an individually conceived good other than the goods prized by one's ancestors and neighbors. The individualist may be a criminal or a prophet or just a crank. But there is a persistent force resident in the conditions which all such free originality has to meet that operates against the criminal, the mere inconoclast, and the mystic without a social gospel.

Confidence that our personal judgment is the standard of truth and our individual satisfaction the test of good cannot after all be successfully maintained. For although we may be sure that an ideal generated by our live criticism of tradition is more adequate than that offered by the latter, and may commit ourselves without reservation accordingly, yet our faith in it wavers and quickly evaporates if the conviction cannot be confirmed that others too would recognize the authority of our ideal if they envisioned social needs as clearly as we do and were not so strongly hampered by the sway of custom over emotion. The end to which I have devoted my energies no longer seems so assuredly good when it is inspected by one who is more than a ripple in the customary current and rejected—so dependent are we upon social support.

Moreover, if I want my free originality to issue in no *ignis fatuus* but to leave an enduring mark in the current of history I must have some assurance that its chosen end will satisfy the real problems of the age more deeply than they are satisfied by the ends now uncritically pursued.

Accordingly, bare rebellion, sheer individuality of self-assertion, is not permanently satisfactory. If our own imaginatively formulated ideals are to maintain themselves and bear their appropriate fruit they must be more than ours. And that means that our controlling purpose must have become a social purpose, our dominating interest that of sharing the real interests of others, and our moving need that of contributing constructively to the solution of problems which arise because of the living needs of our fellows. As Hegel would have put it, this stage is a synthesis of the two preceding stages, preserving the inherent social reference and loyalty of the first and combining it with the free imagination and live responsibility of reflection of the second. In this third stage, then, we make our own what by the keenest insight we take to be the enduring problems of the world around us, and our ideal is that of furthering the realization of all other ideals so far as they can be harmonized into a single picture of human good. There is something summary and conclusive about this stage, just because all more limited finalities have been surrendered in favor of a living hospitality to whatever goods present themselves

as such to any center of experience. It is a final stage because it has consciously attained universality of reference, unlimited by variations of circumstance; in it the good of the individual becomes by his free act of self-commitment identified with universal good.

Words need not be multiplied to show the essential community between this conclusion and that to which we were led by the preceding analysis of the psychological implications of an interest in discovering universal laws. Surely if one's controlling purpose is to contribute toward the realization of all other purposes one obvious and basic way in which to do it is to supply as far as one can instruments that can be confidently used to promote any purpose to which they are relevant. Since the whole intent of science is to provide such instruments, intellectual and mechanical, it becomes so far forth identical with this generalized purpose emerging in the third and final stage in the growth of valuation in an individual's experience. It is not quite identical, for, as we so painfully see, universal laws are not always used toward ends informed with the same deeply socialized purpose that is disclosed in their discovery, while in the existing state of politics we can obviously not insist that scientists take the responsibility of seeing that the fruits of their labor are used toward universal ends. There is thus a certain gap between the purpose of science and socialized purpose in general which we may briefly inti-

mate for the present by saying that the task of religion and education in the formation of socialized goals is indispensable as well as the contribution by science of universal means.

Chapter III

THE TENTATIVENESS OF SCIENTIFIC THINKING

The second characteristic of scientific thinking through which we may scrutinize the attitude or ideal underlying its procedure is its tentativeness. At first sight it might be thought that the notions of tentativeness and empiricism had little in common with each other. But we shall find it of value to open the discussion of the former with a few reflections on the meaning of the latter.

If there is a feature of scientific research that has more than any other impressed its stamp upon the overt intellectual habits of modern times it is its empiricism. The modern world prides itself upon being empirical. Now empiricism means respect for facts. And not only has the modern business man acquired this respect sufficiently to relish having at his command men who can show that they know the facts, but the fashion is even quickening the minds of democratic statesmen, some of whom find it not impossible to gain reelection when they have supported impartial investigations of relevant data before passing important legislation affecting their constituents.

What is the alternative to ascertaining and respecting the facts? Of course, following somebody's preconceived opinions about the matter in question. But if we are tempted to suppose that the difference between fact and preconceived opinion is an innocent thing, and that it is easy to say just what is a wise way of showing respect for facts, we are greatly mistaken. The difference testifies to a devious evolution of thought and experience and the genuine habit of respecting facts is a most remarkable human achievement.

If we question anybody's affirmation that so-and-so is a fact, what do we normally regard as the most indubitable confirmation of it? Unquestionably that the thing was seen, or heard, or touched, or otherwise directly reached through the medium of the senses, and this by enough cautious people so that the possibility of illusion becomes remote. And experience seems clearly to support the supposition that a great many events can be vouched for as real facts without serious likelihood of error. Such are those agile motions of external objects which from the start of our conscious experience force themselves upon our attention and bring about their own differentiation from the background upon which they move, as in the case of people, animals, rolling balls, the swaying limbs of trees, and the like. Having been many times startled into attentive observation by these shifts in the external scene, we extend the same lesson while still in our cradles by sponta-

neous manipulation of things that we can suck, thump, and push. The solid deposit of such experiences in memory, together with the later won ability to communicate by language similarities and differences, enables us to make use of the testimony of others; accordingly we vastly extend the factual content of our personal experience by appropriating what we take to be things seen or heard as facts in the experience of our parents or friends.

Thus there rapidly takes shape around all of us a world of objects and events that we accept without question as factual.

But when we raise a few critical questions about even the minimum of assumptions involved in this procedure we find ourselves in puzzling difficulties, while if we attempt to extend the range of our assurance still more serious ones becloud us. We are embarking on no systematic essay in the psychology of perception and hence shall simply select one of the most decisive factors to consider.

We must note first that what we call a "fact" is fundamentally a social matter, an affair of community agreement. Examination of cases of illusion and of error shows that unless we can secure social corroboration of our perceptions we inevitably lose confidence in them ourselves, or at most confine reference to them to our personal soliloquies. This can hardly be avoided, for our relations with other people are so pervasive that we need to have a foundation of social objectivity in the things that we

take to be real facts. We need to live in a common world, not a world of individual imagination, and what we affirm to be a fact must be a member of that common world. Secrecy is all right in its place, but facts must be tough enough not to waver before others.

But is there really any such common world to be found? To common sense of course it seems evident that there is, and common sense is right to the extent that different people do manage within limits to identify the same objects by the same names. If we examine, however, a factor which always conditions our perceiving activity, we shall run into certain perplexities, and it is these to which we must largely appeal in the effort to lay bare the real significance of the modern respect for facts.

We are all familiar with the interesting historical circumstance that the French and German official accounts of pivotal scenes in the Franco-Prussian War of 1870 differ greatly in their description of certain particulars. Each of these accounts is based on the testimony of eyewitnesses to the scenes. Presumably none of the staff officers whose testimony was thus used could be shown to be abnormal by any accepted tests of abnormality, and presumably all were interested in seeing just what happened and in reporting correctly. Why then the irreconcilable differences in the accounts? Well, it is evident that none of them would be able to see everything that happened in all its detail, accord-

ingly a certain selectivity must have been functioning in their observation, even though perhaps no further distorting factor need be admitted. And why did not their observation select along identical lines? A large part of the answer lies surely in the fact that the expectations of these men would be different; they would not be looking for exactly the same things, and this because their controlling mood and bias in the whole series of events of which this was a part diverged greatly. The German would be eager to note everything that might heighten the glamour of the victory and exaggerate the humility of the conquered; the Frenchman would be as blind as possible to such things and would be on the watch for evidences of dignity in defeat as well as for tokens of arrogance on the part of the victor; while a visiting correspondent, although presumably more impartial in these respects, would naturally have a special eye for those features of the occasion that chimed with his anticipations or would be of special importance to his readers. In short, does not experience testify with sufficient force to the hypothesis that what we see is very largely determined by what we expect to see, and that what we expect to see is determined in the same way by our prevailing mood —the latter being but a shortened way of saying, by what we want so persistently that it leaves its effective stamp on our character?

Some years ago a German professor staged a mock riot in his classroom. The students who were to

participate were given careful instructions in advance, and no one else knew anything about the plan. The riot was brief and what actually transpired was simple enough, though of course highly unusual and totally unexpected except by the few who took part. At the close of the strange scene the professor asked everyone in the room to write a full description of what had happened. All the accounts were erroneous in some particulars, the percentage of error varying from twenty-six to eighty, and contradictory statements of this or that detail were many. Had the affair been argued in a court of law it would have been a sorry puzzle indeed for a judge or jury to determine with any confidence just what had taken place from the irreconcilable offerings of these eye-witnesses to the scene.

Cases more or less similar are well known to all of us. How much do they indicate?

Any event which thus thrusts itself upon our attention starts in motion at once a train of attempted interpretation. That such a train is functioning is of course still more obvious in the situations created by our own active curiosity when we pursue systematic observations of a puzzling occurrence. We do not at first know what it is that is going on, but are interested in finding out if we can. What fact we shall take the event to be depends upon the outcome. Now examine this train of interpretation in order to see how it operates. It is evident at once that we shall have to resurrect from our past experience the

general images and conceptual pigeon-holes with which to classify it, for we have no others. Next, it is evident that the order in which we try the pigeon-holes which seem possible is determined by our expectation of their probabilities; if we see first a distant object that catches our attention as a dog burrowing in the grass it is because of the various possible ways of perceiving it at that distance our expectation favors a dog more than other alternatives. But what, further, determines the expectation itself? In part, what has seemed to be verified previously in situations similar; in part, our dominant interests, which play over the images and ideas congenial to them much oftener than others, and make it easier for the ones thus favored to flash into mind as answers to puzzles that spring up in experience than the ones not thus favored by our desires.

All this is very simple psychology which I think will be readily confirmed by anyone. Examine the common case of having misread a newspaper headline in glancing hurriedly over it, and note the factors that seem to account for committing the error. But two rather important consequences issue from it. In the first place, those events which are gone rather quickly or which only excite interested attention for a moment, obviously confine our interpretations to the few alternatives most strongly in line with our expectation and for the same reason most harmonious with our prevailing mood; the

thing is past or forsaken for something else before we have had time to criticize these early suggestions by more extended and less partial observation. This is doubtless the main explanation of the startling variations between eye-witness accounts of sudden or complex events, which enforce distrust of all but the most fully disciplined perception and require the careful legal technique which has been slowly created to secure criticism of the statements of witnesses. And in the second place it means that a perception rendered thoroughly objective so that it has become emancipated entirely from distortion by personal interest and prejudice is an ideal goal of attainment that we can never be assured has actually been attained. For, as occasional experience teaches, an event may not be the fact we take it to be after inspection from the closest possible quarter and with the utmost attainable care. But in those situations whose bearing on human welfare is vital this ideal of objective facthood becomes rather closely approximated.

Now this is again to say, of course, that the simplicity and assurance of so-called empirical fact have quite vanished in the distance. It means that, strictly speaking, the "common" world which we take for granted so easily is not actual but represents an ideal which for practical community needs we try desperately to attain. Moreover, the distinction between empirical fact and preconceived opinion has vanished also, at least as an absolute distinction, for we see

that we always necessarily perceive in terms of the concepts which our past experience has made familiar and which the hovering interests shaped by the past lead us to apply. What we call fact is always a selection among preconceived opinions. Fundamentally, we can no more disentangle ourselves from this necessity than could the most conservative of mediæval students; what then does it really mean to speak of science as empirical and of an age vitally affected by science as an empirical age?

I think the answer to this question will be found if we ask ourselves how, in the light of the conditioning factors just outlined, we should go about it to render our perversions negligible and our perception as objective as possible. In general terms it is evident that we can make progress in this direction only by consciously endeavoring to withhold confident interpretations till in the face of the event in question we have passed beyond all the alternatives that at first aroused our expectation and are freely considering ones that originally ran contrary to our dominant mood. In this way only can we be confident that our prejudices are not seriously affecting what we take to be fact. And this general statement involves two important corollaries. The first is that our controlling interest itself must have outgrown biased moods, so far as possible, and have taken into itself a constant readiness for the novel, so that we count it more important to discover in any occurrence what transcends our original expectations than

merely what fulfils them. Thus alone are we able to bring to light important distinctions that had not been noted before. We may express the same truth in terms of habit: the virtue of empiricism lies in the formation of the habit of looking in any situation for more than our prevailing interests and the concepts formed under their guidance would lead us to anticipate. Our observation, in short, must become live and creative rather than merely repetitive.

But if we are to mean by fact something socially objective there is another corollary equally important. Since what we perceive is determined so strongly by what we are interested in perceiving, if we are to be able to perceive what others are likely to perceive and thus live in a common world with them we must share their prevailing interests. It is not physiologically compulsory for us to see what other people see. We may affirm, then, that the observation most likely to issue in objective results is the observation delivered by a mind which has been sympathetically socialized as widely as possible. It may be that the real reason why all of us are able to reach agreement over such a large area of our observations is that our ordinary purposes in dealing with the surrounding world are the same, or contain a large identical element.

To have made a broad beginning in the direction of this transformation is a remarkable achievement of the modern world; we must certainly count it so if we compare the empirical attitude of science with

the torpid basking in traditional authority in which the thinking of mediæval times was so lazily embedded. That is the attitude of committing oneself to a closeknit hugging of the interpretative concepts given shape in the past; instead of being always ready to transcend the meanings for which acquaintance with these concepts prepares us we fearfully feel it impious to admit anything novel and bathe ourselves in an atmosphere of unquestioning loyalty to an inherited system of ideas, forgetting that each of them was once as novel as those we now fear to embrace.

Some people do not want to see objective fact. The story is told of a rustic, who, on a visit to a circus, was observed running away from the giraffe's pen, his hands before his eyes. When asked to explain his strange conduct he replied, "If I keep on looking at that critter, I'll really believe there is such a thing." The anti-empirical attitude could hardly be more happily voiced.

If we study in the light of this description the progress of early modern science we shall see evidence everywhere that the real conflict it had to face was the conflict between these two attitudes. When Galileo eagerly built his first telescope and watched through it the movements of the hitherto undiscovered satellites of Jupiter, his observations were at first guided by the expectations encouraged by past knowledge but were not ultimately controlled by them. When something seemed to present itself

which was not provided for in the Aristotelian astronomy he did not flatly assume that it must be an illusion nor did he turn his eyes from the queer occurrence as from an impious spectacle. His observation was free, creative, and moved by an interest which found greater satisfaction in discovering something new and formulating its laws than in maintaining the revered authority of tradition. But the fundamentalist professors of his day who screwed up courage enough to come and peer through his machine—did they *see* the motions of these satellites in the same sense in which Galileo saw them? When we note how they return to their academic halls and continue to teach the now exploded astronomical ideas we can hardly say that they did. Their observation was so fully immersed in the attitude of loyalty to tradition that their sense organs could not attain to the wit of recognizing novelty. The thing seen *must* be something else than what it appeared to be, perhaps even a prank of the devil embarked upon to deceive them, if they could not justify their rejection of it in any more edifying or plausible fashion. Whatever they saw they saw through the kaleidoscope of ideas collected in the commentaries of Aristotle and the treatises of the church fathers, and any unexpected interloper simply could not register its existence. And there was another trenchant line of defense too; even though some reality might be attributed to these strange things the fact that treatment of them was omitted in the sacred liter-

ature sufficed to indicate that they were of inconsequential importance for the great end of human life, salvation in a world beyond the present where all things material were to have been swept away in the heat of a consuming divine fire. How impertinent and dangerous to occupy oneself with such unorthodox enquiries instead of devoting full energy to the tremendous task of saving one's immortal soul!

The issue of fact versus preconceived opinion means at bottom then the issue between an observation freely ready to criticize and outreach the traditional ideas with which all observation must begin and an observation ultimately mastered by loyalty to such ideas. But when the matter is stated thus we are brought face to face with the characteristic of scientific thinking which the present chapter promised to discuss, namely its tentativeness. Let us explore some of the further considerations suggested by the notion of tentativeness and see how far their consequences prove identical with those to which the chapter has already introduced us. The human achievement which this word represents is really a stupendous one. We do not ordinarily suppose that learning how to see and hear facts is a difficult matter, but such is really the case, and to extend the necessary tentativeness to other situations is sometimes harder still.

The prevailing assumption of the ancient world was that there was really no fruitful, promising

state between knowledge and ignorance; knowledge meaning full, self-conscious possession of the truth, and ignorance its complete absence. One of the toughest difficulties faced by Greek philosophy arose from this fact and is reflected for us in the dialogues of Plato. How can knowledge ever be acquired? For either a man possesses it or he does not; in the former case it does not need to be acquired, and in the latter case he is empty of everything which would enable him to take any genuine step toward knowledge. One completely in the dark cannot even make a sensible guess as to the direction in which he needs to move. Of course there is what Plato called right opinion; judgment which happens to hit the mark by a happy guess but is not certain that it has hit it and cannot therefore correct itself by conscious possession of a standard. Obviously, as far as the attainment of knowledge is concerned right opinion is hardly more promising than complete ignorance, for to have truth by chance is little more likely to offer confident control for the future than not to have it at all. Plato's answer to the problem was accordingly quite consistent. Knowledge really never can be acquired at all, and to account for what we actually do possess of it we must hold that it is implicitly carried over from a previous existence of the soul and is recalled to mind from point to point by occurrences in our present experience. Aristotle did better with the difficulty but was still far from attaining the notion that is essential to modern science.

And it is certain that most people today are pretty much one with the Greeks on this question; where they are ignorant of a matter they would be at a loss to know how to remedy their ignorance in any other manner than that of asking somebody who already knows. The perfect naturalness of this method, rendered perennially so in the daily relation of child to parent and pupil to teacher makes it easier to understand the proneness of the western world which believes in the fatherhood of God to be convinced also that he must have left somewhere a written revelation enclosing clear answers to all its important problems. But until the advent of modern science the question how anybody could have found anything out in the first place was a baffling difficulty. If we can bring ourselves to share this perplexity with prescientific thinkers we shall realize how inevitably they felt themselves forced to the conviction that the only way out of the puzzle lay either in our possession of knowledge in a previous state of existence or in the assumption of an omniscient God, from whom, either directly or indirectly, all human knowledge was derived.

But so far we have touched on the intellectual form of the puzzle merely. There is a much broader social and moral conflict involved, and this is perhaps the causal factor behind the intellectual bewilderment.

With some apologies to a handful of scientists and to practical statesmen who never generalized

their actual procedure, it may be stated as the common conviction of the ancient and mediæval world that it is quite improper and socially dangerous to be uncertain about anything of moment. Ignorance is a crime; sure knowledge is morally required. Now this insistent feeling might have buttressed an eager and careful search for dependable knowledge, but as a matter of fact its spontaneous form seems rather to have been a hysterical demand that what already passed for knowledge in the community must be adhered to unquestioningly as certain, conformity to which is therefore a fundamental moral duty.

We are all natural dogmatists, possessed of a pompous zeal to fulminate authoritative opinion, but the main reason for this turn of the prizing of knowledge lies in what at bottom is an entirely sound instinctive feeling. A community must be coherent and unified to the last possible degree to insure success in maintaining itself against the hazards of existence. This means that the dominant ideas as to the ends worth pursuing and the main means to be counted on to procure them must be firmly and unquestioningly held by every member of the group. Especially is this true of ideas as to fundamental moral attitudes, not to say the religious technique counted upon to win the favor of the gods, who control the forces on which existence and prosperity so obviously depend. Then from the dogmatic beliefs on these matters a halo of pert assurance spreads out over all other supposed knowledge and

invests it with a certain sanctified authority. Anything which interferes with the loyal maintenance of these ideas at any point and introduces uncertainty, doubt, or hesitancy, is naturally felt to be prejudicial to success in the struggle, for if ideas are questioningly held action based on them will be weak, fitful, halfhearted.

The particular way in which all this functioned in the mediæval world out of which has budded our modern age is sufficiently familiar to all of us; intolerance of heterodoxy in religious belief has probably been more violent and taken more fanatical shapes in the western world than in any other part of the planet. Such a book as Bury's little *History of Freedom of Thought* gives an excellent account of the course of transformation in the attitudes of the western world in this respect, yet very far from complete, which apart from such considerations as we have mentioned might seem most astonishing and inexplicable. It is not so long ago that there was no part of the occident in which free thinking on even the details of accepted dogma did not subject a man to harsh social persecution, while to be an outright atheist or agnostic was unthinkably terrible.

The belaboring given agnosticism when it was formulated two generations ago by Huxley is a most interesting recent indication of the continuing resistance to the scientific notion of tentativeness on the part of popular attitudes. To be an agnostic is simply to say that one does not know whether the

great faiths of religion are well founded or not. That the common religionist did not distinguish between atheism and agnosticism may in part be accounted for by the almost universal tendency to be careless in dealing with unfamiliar distinctions. But that there should be such a deepseated feeling that agnosticism was socially as dangerous as atheism illustrates the assertion that the prevalent human attitude insists that maintaining a show of certainty about traditional knowledge is a basic virtue and doubt a social crime.

Before science came to have general influence on human thinking the only champions of genuine tolerance to be found were an occasional philosopher like Spinoza or a statesman who discovered that fruitful endeavor to mould his people into a real unity of national feeling was quite impossible as long as groups of theologians each maintaining dogmatic infallibility wrangled ferociously over pinpoints of doctrine and walked about in frowning suspicion of all who differed on any contention of their lengthy creed. The great plea of Oliver Cromwell to the contentious churchmen of his day allies him in this fashion to the scientific spirit which was already beginning to season minds of a more speculative and experimental temper around him: "My brethren, by the bowels of Christ I beseech you, bethink you that you may be mistaken." [1]

[1] Quoted from A. N. Whitehead, *Science and the Modern World,* p. 24.

It is hard indeed really to think that one may be mistaken, however much inadequacy in our previous opinions and continued changes of conviction would seem to enforce recognition that we have been mistaken. We would rather be foolish and blind than acknowledge our doubts. With all the yearning of our souls we want to feel certain, at least about the matters that seem to us of greatest moment. Nothing is naturally more painful than the state of genuine doubt. We feel that we *must* know, with absolute assurance, what is worth doing in this transient life of ours, and how it should be done. But the modern world has gradually been coming to a most momentous self-revelation. It is discovering that it really is uncertain about almost everything of moment, and that when this is the case much more harm is done by a delusive hugging of finality than by a frank recognition of uncertainty and a systematic effort to reduce it. Our stanch zest for infallibility is being dislodged. This gradual self-revelation is most fully evident in the scientific attitude of tentativeness in dealing with concepts and laws, and is directly symbolized by the conception of *hypothesis,* a conception far removed from the guiding notions of ancient thinking and testifying to a profound revolution in human nature.

Superficially the thinking of liberal people in the contemporary world has already been much pruned by the method of hypothesis. Few words from the vocabulary of cultured folk are more familiar to-

day than the words hypothesis and theory. With the hyper-sophisticated it is quite the thing to have no convictions that cannot be pleasantly discussed and renounced in a cloud of smoke. Though science does not mean flippancy, this is a symptom of the transformation under way. But let us not take all this so easily for granted that we fail to realize the modernity of the attitude expressed nor the extent to which much of our thinking still wanders in stark contradiction to this attitude. We shall find that the vital question for us to decide is the question whether this attitude is rightly universal or not, and if not just where and what is the nature of its limit.

The key to the whole historical change at this point lies in the discovery of a method of verifying and extending knowledge such as for the first time reveals clearly what is the true medium between knowledge and ignorance. That medium we may curtly describe as ignorance really on its way to confident knowledge. This is none other than the method of scientific hypothesis. It is a method of putting to use the most adequate ideas which at any given time we possess in such a manner that the range of their application becomes more closely defined and the further ideas needed to correct and supplement them are stimulated to take shape in imagination, themselves in turn to be verified and disciplined.

When a scientist finds himself ignorant with respect to a challenging problem he does not turn to

divine revelation to find the answer nor does he feel himself confined to a series of chance guesses, one of which may without his knowing it be the true answer. He knows how to go about it so as to make definite progress toward knowledge. Let us describe his procedure in general terms and then turn to a concrete illustration. First, he brings to bear the best ideas already available on the matter, and under their guidance engages in systematic observation of the problematic situation. This observation is of course thoroughly empirical in the sense in which empirical has recently been defined. As he pensively scans the puzzling data guided by what the past has taught but always ready to see something more, suggested explanations of the puzzle arise in his mind. What are these and where do they come from? Not being God, he has of course not created them out of nothing. They are ideas by which in the past he has successfully solved difficulties which in this or that definite respect are similar to the present baffling event. But as yet any such idea is a suggested solution only, it lacks verification. Now just as he put the best past ideas to work in guiding his observations and producing a relevant suggestion, he puts in the second place the suggestion thus secured to work in a manner calculated to bring about its own verification or disproof.

A suggestion discovered and used in this way is what we call a hypothesis. The suggestion itself is an idea, a concept, and cannot be empirically ob-

served; it is therefore necessary to deduce from it certain consequences that can be empirically observed in order to tell whether it fits the facts and may pass from the stage of hypothesis to that of verified law or whether it is to be rejected as a mistaken guess. If the idea is true, what follows from it in the way of overt results that must then also be true? And the telling itself is a matter of further observation, combined where possible with experimental manipulation of the data in such a manner as to produce situations which could not otherwise be observed or to render them observable in less confusing and more manageable ways. If such verifying observations lead to the collapse of the theory, this does not mean a complete impasse; the scientist knows how to use this failure to make the next step more likely to succeed. Just what was there about the hypothesis that made it disagree with the facts? As he ponders this question in the light of his experimental observation, other suggestions will tend to come to mind that will avoid the inadequacy of the rejected hypothesis while at the same time conforming to all the other considerations that his work to date has shown to be respected. This second hypothesis he then puts actively to work in the same way as before, with the probability increased that it will win confirmation instead of rejection.

Of course there is no guarantee that in any given case sound knowledge will be reached by this method. A challenging mystery cannot be vanquished merely

because we venture the attack. But the history of science proves that as an active procedure of replacing ignorance by knowledge it is far more successful than any alternative, and by its use, within a brief period of a few hundred years, enough has been accomplished to yield a degree of understanding and control of nature that would earlier have been beyond the prophecy of the most exuberant imagination. It is in fact enlarging human knowledge by leaps and bounds, and witnesses vividly to the fact that in the modern notion of hypothesis we really have the fruitful intermediary between ignorance and knowledge.

We may pick a convenient illustration. When Galileo faced the problem of the rate of motion of a freely falling body he was guided by such knowledge as was already available as a result of commonsense observation, namely that the motion was one of acceleration. But there was an element in his problem that had apparently never occurred to anyone else. He wanted to know the quantitative law according to which such acceleration took place. The notion that there was such a quantitative law was rendered probable to his mind by the recent extension of quantitative statements of motion to the motion of the earth in the Copernican theory. As he experimented with various falling bodies, such as the cannon balls he dropped from the Tower of Pisa, producing observations that might lead to a fruitful hypothesis, the suggestion that first seemed plausible was that

the velocity of such a body increased directly with the space it traversed. Due to the fact that the relations of motion with space had previously excited more scientific attention than its relations with time, this was an entirely natural beginning. As a matter of fact the acceleration thus conceived was too slow to fit the facts, and Galileo discovered an indication of this inadequacy when reasoning out the implications of the suggestion, so he rejected it without submitting it to experimental trial. But if this was inadequate, what sort of hypothesis would promise a better result? Since time was the other important factor in motion besides space, it was natural that he should turn to a similar hypothesis about the temporal relation of the fall. Accordingly he hypothesized that the acquired velocity is directly proportional to the time of the descent. But this idea of course could not be empirically tested without setting up some technique of measurement constructed in accordance with the deduced consequences of the idea. Since we have to measure time by changes in space, Galileo deduced the implications of his hypothesis in the following form: Velocity means space multiplied by time, hence a velocity increasing according to the time will mean space multiplied by time squared; that is, if a body fall in 1, 2, 3, or 4 units of time, it ought to traverse 1, 4, 9, 16 units of space. He could not, as a matter of fact, measure this accurately with freely falling bodies, so assuming (an assumption which he justified later) that

a sphere would roll down an inclined plane according to the same law, he notched off on his plane distances equal to 1, 4, 9, 16 units, and proceeded to test his hypothesis by the aid of a water-clock which he also had to invent to measure accurately small intervals of time. Finding this hypothesis completely confirmed by the experiment, he pronounced it a verified law that the motion of a falling body is one of uniform acceleration, that is, a motion in which equal velocities constantly accrue in equal intervals of time. Here was a concrete case, typical of the whole history of science, of ignorance passing into knowledge by the definite procedure described in general terms above.

But the significance of the tentativeness of scientific thinking does not end when we have considered its manifestation in the conceptions of empiricism and of hypothesis. The scientist does not assume that verified laws themselves can be confidently held in any absolute or final way. When he accepts a law he carefully avoids the promise to be faithful till death do them part. Laws will be held with historically relative confidence as summaries of regular relationships in a certain sphere of nature which we are justified in adopting as the basis of further inference, but they are not to be so firmly held as to be regarded established once for all and unchangeable. They will always remain true in this important sense, that the observed facts on which they were grounded are still what they are and therefore any law which

displaces them must respect these facts while accounting also for others which the earlier theory neglected. But that such neglected facts are continually likely to appear is taught by the whole history of exact thinking; indeed the further exercise of creative observation over the range of data in question will be tolerably sure to uncover them. Thus all scientific laws are tentative in the sense that they must face the ceaseless discovery of data, some of which, when honestly faced, will demand their revision. The most soundly established law at any given time will prove to be but a limited approximation to the truth as later disclosed, a point which hardly needs vigorous statement in an age of physical science just engaged in transcending and limiting the Newtonian laws which had been taken for granted for two hundred years.

How radically different this attitude from that zest for certainty which characterized practically all ranges of pre-scientific thinking, especially on matters of morals and religion! The feeling pervading scientific research is that our native tendency to hug certainty should be willingly surrendered in favor of a quite different valuation, a conviction namely that the highest intellectual goal is rather readiness to use the best knowledge already available for its own correction. The type of character accordingly which the scientific interest tends to develop is one in which this forwardlooking intellectual tentativeness is focal and controlling. The difficulty, of course,

in this psychological transformation is that one does not see at first sight how to combine this attitude of tentativeness with practical readiness to act on the basis of one's knowledge. Such practical readiness is an elementary and inexorable demand of life. All of us face situations in which we have to commit ourselves to action on the guidance of the best ideas available, as when a loved one is stricken with disease or a decision affecting the whole of our future must be made. It helps greatly in committing ourselves decisively to action if we can suppose that the guiding ideas are absolute and certain; in fact, this is probably the underlying pragmatic reason for the insistent feeling of humanity that the moral and religious convictions most momentous for man's welfare are sacred and backed by omniscient authority. Perhaps the greatest achievement of character which the world needs is the combination of practical decisiveness in moments requiring it with unreserved intellectual progressiveness. This is the new ideal of character revealed in and supported by the tentative procedure of modern science. Difficult as it is, all of us have to attain it at times. When afflicted with a serious and obscure ailment we place ourselves unreservedly in the care of an expert physician, knowing that his judgment on the matter is likely to be the best available at the time, while knowing equally well that his judgment is fallible and often no more than a hazy guess. The possibility of achieving this combination over wider ranges of

life is indicated by the scientist's readiness to put his theory actively to rigorous experimental test while it is still a quite uncertain hypothesis. Intelligent action does not require certainty, and this fact itself must be recognized if we would become by the grace of science more certain than we are.

It is evident that on this general point of tentativeness the human meaning of empiricism and that of hypothesis entirely coincide.

Empiricism means tentativeness expressed in the specific activity of observation; hypothesis means precisely the same attitude expressed in the use of ideas drawn from the past to guide observation. They are the same purposes realized in two different ways.

It is hard for men to surrender the eager quest of certainty. Especially in the case of those in whom runs high the feeling of reverence for the great achievements of the past, the tendency to attach oneself inflexibly to hoary notions that most deeply appeal is an almost unconquerable tendency. To render flexible such attachment seems like cutting at each step a cord tightly bound to every heartstring. It is to become a man without a country forevermore; to weigh anchor with no prospect of ever lowering it again. Ideas that one knows may be abandoned seem paltry and insipid. The question thus becomes pressing—should this transformation of character be universalized, so that we take for granted that it should be expressed in all our thinking on whatever

subject, or are there certain ideas to which we may justifiably give unreserved devotion? And on what ground may we justify our answer? The parallel question suggested by the discussion of universality of law was taken up at the close of that discussion itself; the present question, however, bears so vitally on religious and other problems that it will be better to postpone answering it to the succeeding chapters.

In the meantime we may simply note that in the institution of modern science we have undeniable indication that this transformation can be accomplished over a very important range of our thinking. We see also the desirable consequences which the transformation produces in enlarging our exact understanding of the world and permitting an unprecedented power of control in the pursuit of whatever ends we count worthy.

One point more is of sufficient interest to mention before the present theme is abandoned. We are familiar today with the almost universal tendency to explain things in terms of their evolution. This of course reflects an inevitable attempt to extend a fruitful notion, that of the biological theory of the origin of species, to whatever ranges of our speculation it seems able to illuminate. But do we ever consider the fact that our very readiness to explain things so universally in evolutionary terms reflects a psychological attitude that would have been quite impossible before the advent of modern science, and that this observation renders explicable the other-

wise curious circumstance that while general theories of evolution have been entertained by sporadic thinkers since the earliest days of free thought, they have never taken hold of our thinking in any vital way till the day of assured scientific achievement?

The age of science is the age of conscious intellectual discovery, that is, the age in which it is realized that what was not known before can come to be known and how the miracle is to be performed. The ancient and mediæval world furnished by contrast an age in which, as was noted above, nobody saw how it could be possible for anything which was not already known, by someone, at some time, to become known. Now the Platonic explanation of this in terms of reminiscence was an unsatisfactory one. As shown by Plato's later speculations and those of Aristotle, as well as the theological enquiries of less keen thinkers, the inevitable trend of explanation on this ground led to the supposition of an omniscient being, one who immediately and consciously possessed all the knowledge that more finite minds could ever come to attain, and who gradually communicated it to them in the ways theologians recognized.

But such thinking about knowledge could hardly be made consistent with any other than a certain definite theory of reality as well. If knowledge is somewhere finished and complete then reality must be finished also; there is obviously no way for even the greatest of beings to be actually omniscient unless everything that is to be known in some way already

exists and is present to his mind. Accordingly, from this point of view we are committed to the doctrine that reality is complete and eternal. There is really nothing new, which had not existed before; novelty is wholly relative to finite thinking, and is simply a term for the fact that what already exists for infinite intelligence can only be gradually appropriated by finite intelligence, and never in its entire extent. Hence nothing really evolves, becomes different from what it already is. The only change admissible in this scheme is a redistribution of material which itself follows an unchanging law and is accordingly in the end a merely circular process. "Tout est donné," in Bergson's epigrammatic description. It is no wonder that ancient thought found in the supposedly circular motions of the heavenly bodies the ideal type of all change, by which every other form of change was to be judged.

But once let a doctrine and method of knowledge such as that of modern science appear and this whole fabric goes into the throes of transformation. The experience of actually attaining knowledge which had not been attained before, and by a method which obviously did not consist in appeal to an omniscient knower, rendered at once unnecessary and less plausible the traditional assumption about the reality to be known. Perhaps there was no such omniscient knower except as an ideal to be approximated as closely as possible by human intelligence in the continued exercise of its dependable method. The sus-

picion gradually comes to prevail that reality itself is not finished. Even God's experience may be growing; the divine mind is mayhap in process rather than a fixed stare at the all. Accordingly an evolutionary type of explanation, which does not wander so far from the direct testimony of the observations of finite beings, and which is thoroughly congruous with the entire character of scientific method, is increasingly applied. It is no accident that the age of evolution is the age in which science has become self-conscious and widely influential.

Chapter IV

THE EFFECT OF SCIENCE UPON PHILOSOPHY

For our purpose it will not be necessary to examine all the characteristics of scientific research since we are interested only in those which are especially helpful in disclosing the transformed attitude that devotion to science tends to bring. The features discussed in the two preceding chapters are the most essential ones for this end, but before we proceed to further questions a third aspect of science must be briefly sketched. The distinctive ideal emphasized by it does not throw such important light on the relations of science and religion, but it reveals the manner in which science has become the peculiar champion of a difficult human virtue.

One will not survey the history of science long before noting the heightened emphasis laid in each succeeding age of scientists on the importance of formulating hypotheses and laws in mathematical terms. So far as ancient science was concerned, outside of the pure mathematical disciplines of arithmetic and geometry, only a few meagre branches were mathematical in form, of which the most conse-

quential were astronomy and optics. A handful of theorems in mechanics might be included in the list. Today it is evident that all science strives to articulate itself in a mathematical frame as far as it can. In the early period of modern science physics was revolutionized by the verification of a few mathematical relations in the motion of physical bodies; Newton's law of gravitation is the outstanding example. Soon a quantitative structure became central in the foundations of chemistry, and in the nineteenth century biological knowledge moved forward by leaps and bounds whenever, as in the case of Mendel's laws of inheritance, a mathematical relation offered the key to an intriguing biological process.

In our day it is the social sciences which exemplify the tendency most notably. Contrast their present form with the social science that functioned in the thinking of ancient or mediæval students. The most transparent difference will surely be found in the place of statistics and coefficients of correlation in the statements of verified discovery presented by modern social scientists. Now these techniques are nothing but ways of putting in quantitative form facts and relations that lack the universality which the exact sciences have often been able to establish. The difference between a statistical statement about marriage and the law of heat is that the former records just such a number of people in a given community as entering the marriage relation in a given time, while the latter states that all cases of change

of heat are cases of transformed motion after a certain quantitative pattern. The difference between a correlation of growth in height with growth in intelligence and the relation between mass and distance in the formula of gravitation is that the latter is universal and unqualified while the former attempts to put in quantitative form the percentage of universality revealed by the relation. And one of the avowed motives behind the program of the behaviorists is that by concentrating upon what individuals do in their reaction to stimuli rather than upon mystic revelations from within it is possible to introduce methods of measurement and thus state the reaction in mathematical terms.

Why this expanding craze for mathematics in science? A liberal part of the answer is found in the need of science for *exactitude*. Where a fact or relation is dressed in loose qualitative terms we cannot make the confident use of it for further understanding or for practical control that is our reward when the statement is given mathematical precision. The ancients knew, for example, that the motion of a falling body was one of acceleration, but not knowing the mathematical rate of acceleration they had no suggestive basis for relating such motion to that of the planets, as Newton did, and showing that the latter were really falling bodies obeying the same law. Nor, of course, without such additional knowledge would it have been possible to manage with accuracy such practical engines as the piledriver

or to determine the range of a gun at a given angle. And in social science the term probability could be given no precise meaning nor could the enterprise of insurance companies be sanely justified if statistical methods of stating facts were not at hand.

Beyond this concrete value of the more detailed understanding and confident control made possible by this quest for exactitude in science, there is, as in the case of universality and tentativeness, a broader human significance due to the pressure of the emphasis on men's attitudes and character.

How vehement and how sadly distorting in its outcomes is the ubiquitous human tendency to let the wish be father to the thought has been illustrated in the preceding chapter. Now experience shows that it is almost impossible to minimize or correct this tendency unless we make conscious use in all our thinking of those ideas which are most objective and least perverted by emotion and prejudice. These are just the ideas of number, of quantitative relationship. We may argue interminably as to which of two great works of art is the more beautiful but there seems no way, in such questions, of fully discounting the variations of personal emotional response. Why do we not lapse into the same bewilderment in questions of distance as well as of beauty? Because distance is a mathematical notion; when it is involved we leave debating for measurement and the question is settled to the satisfaction of any honest enquirer. One cannot argue with fairly collected fig-

ures. If beauty were a quantitative idea, should we not do the same in esthetic matters? Eagerness to apply mathematics everywhere in science is thus an aspect of the desire to secure results that transcend individual biases and are socially acceptable; it is that desire expressing itself in the form of utter candor and strict intellectual integrity. This moral quality of science it was that most strongly seized upon Huxley in his essays on the value of science. When one informs me not merely that a certain thing is so, but that precisely thus much of it has been observed to be so or that it has been seen to be so in just such a number of cases, I glean that the statement is not the product of emotional dogmatism, but attests a sincere, careful, and patient effort to square preconceived biases with an objective study of the matter. I see in it also a willingness to put the outcome in such a guise as will enable later investigators to use it to the full in distilling a still more exact result based on more complete observation. It reflects honest cooperation in the enterprise of knowledge as against dogmatic haste to mouth broad generalities without qualification. Emotional pressure on our beliefs leads so easily in all of us to a strain of pretentious hypocrisy that a weapon by which its effects are annulled gains high value in scientific research.

It would not be wholly gracious to religion to say that by reason of its dogmatism and its will to subordinate lucid thinking to emotional absorption its influence has on this point been thrown in the

contrary direction to that of science, because integrity has often been a high religious virtue along with submissive faith in tradition. The reason why religion has not been able to stand squarely for the former is, however, bared in the work of science; one cannot combine it with passive acceptance of traditional ideas. But its tremendous human value as against the latter is patent when we note that the same considerations arising from our practical needs which enforce the desirability of dependable knowledge enforce likewise the desirability of stating that knowledge in exact terms. Here again it is science that has pushed into the foreground a virtue, hitherto ambiguously regarded, that must be made central in human character if the more enduring satisfaction of our needs shall be realized.

But so much analysis of what has been termed the ideal of science ought to suffice to clarify and justify the thesis of the introductory chapter. Before we turn to the definite corollaries that ensue for the problem of religion let us face more fully a question broached in preliminary fashion in the opening chapter and answered in the second so far as touches the implications of universal law. What confidence may we have that these values of tentativeness and exactitude which underlie the procedure of science do not constitute arbitrary and evanescent vagaries, but express ends deeply rooted in human needs?

As concerns the bearing of tentativeness on the

156133

problems of religion, answer to this question is left to the following chapter. But it will help us reach a general point of view on the question if we consider the effect of science on modern philosophy. It is the ambitious task of philosophers to attempt in a more persistent way than others to "see life clearly and see it whole." Whether any of them comes very near the ideal expressed in this now classic phrase, at least because it is their especial function to pursue such a goal it may be legitimately assumed that they are more apt than other folk to glimpse the more momentous issues expressed in the changing trends of their time. It is for this reason that the repeated emphasis of philosophers in one century may reveal to a keen eye what are destined to be the prevailing beliefs and attitudes of the next. The essence of mediæval life was prophesied by the increasing tendency in the later ancient philosophy to appeal to a divine being as the source of all good and the standard of all truth. Likewise the chief tendencies of the modern period to date are clearly glimpsed in the Renaissance philosophers whose visions came to full clarity in men like Bacon and Descartes. Accordingly it ought to be possible by examining the trend of contemporary philosophy to test the power and promise of the ideal of science; is philosophy more and more emphasizing the characteristics we have been expounding, or is it passing them by as transitory and superficial?

Well, the two philosophical currents which will

be most generally acknowledged as growing in influence today are those termed pragmatism and realism. We shall attempt a brief analysis of the contemporary philosophical situation and see whether it bears a verifying relation to the conclusion reached in probing the scientific spirit.

The distinctive purpose of philosophers, it was said, is to see life clearly and see it whole. If we ponder the results of this attempt at synoptic understanding, however, we soon discover that very different ideas are supposed by different philosophers to constitute such understanding and test its attainment. Fundamental disagreements among philosophers are proverbial. This indicates that one thinker does not have the same thing in mind by "understanding the universe" as the next thinker does, and if our analysis in chapter three of what happens in an attempted explanation of anything be recalled, a ready reason for this variation will appear. This is the fact that our explanatory activity is necessarily affected by dominant interests which differ in different individuals. If we would grasp, then, what philosophers are really doing when they try to understand life as a whole we must penetrate the motives ruling their thinking and accounting thus for the radically different ways in which they interpret what is supposedly the same object.

Prior to the present generation the philosophy most relished in the western world has been idealism. This way of interpreting the world assumes

diverse forms in detail, of course, but there is a core of unity in all these forms which on account of its powerful and long-continued appeal it highly behooves us to appreciate. As just suggested, the way to win this appreciation is to probe the controlling motives of idealism, that is, to bring into the open what idealists implicitly if not explicitly take to be the essential purpose of philosophy.

Fortunately, some idealists have themselves been quite conscious of the need of dislodging for scrutiny such underlying assumptions of purpose. Consider a recent statement by a well-known idealist.

Says Professor Hoernlé in the introductory chapter of his *Idealism as a Philosophy:* "There is a deep-seated need in the human mind, the roots of which strike far beneath all other needs and interests. This is the need to feel at home in the universe. From this source spring all philosophies and all religions, though it is only in the most highly developed philosophies and religions that we have become reflectively conscious of this need and of what it demands for its satisfaction. It is a need which at once demands to understand the universe and to approve,—nay, to love it. It wants at once truth and perfection. It wants what men mean when they say 'God.' "

Professor Hoernlé evidently assumes here that the effective push in philosophical enquiry is the one behind most of our serious thinking prior to the advent of modern science. The radical need of man,

as he sees it, is a sense of unshakeable certainty, of basking in full possession of ideas so firmly grounded in the structure of things that we need never fear their loss of validity and hence need never waver in our loyal devotion to them. It would be superfluous to point out the violent contradiction between this attitude and the thoroughgoing tentativeness of the scientific mind, at least if either be believed universally legitimate.

It is hence no accident that Professor Hoernlé proceeds to describe philosophy and religion as in the most intimate relation. Both spring, he says, from the same source; philosophy, like religion, wants to secure such an understanding of the universe as will make it an object of love as well as of intellectual contemplation; both seek what men mean when they say "God." Now there can be little question but that this account is historically correct of the deepest motive of religion. Religion seeks salvation, by which it has meant an eternal at-homeness in the world in indissoluble union with God, who ultimately controls all things in the interest of a loving plan. So far, accordingly, as a given type of philosophy means by philosophical understanding the winning of such an assurance, the type in question is thereby revealed as the metaphysic of religion. It is that interpretation of the nature of the universe that results when the orthodox interest of religion is accepted as ultimate and given rein over one's philosophical thinking. The connection

then between two challenging historical facts is no mere coincidence—the fact on the one hand that the prescientific era was the era in which religious motives were almost universally uppermost in men's thinking, and the fact that the same era was characterized by the clear dominance of idealism in philosophical circles. From this standpoint all reality is explained as ultimately caught up in a single purposive unity, embracing the harmony of our highest ideals of perfection in a single existent being, who is on that account either personal or superpersonal and becomes an object of worship as well as a final principle of explanation. Philosophizing culminates in the faith that reality can only exist and only be known through God.

Now the fact that religion has continued to function in the modern world as a powerful intellectual as well as general cultural force accompanying the growth of science, may help to account for the fact that idealism has remained a popular and influential philosophy down to the present generation. But so vigorous is the growth of pragmatic and realistic tendencies today that among the younger philosophers who begin to engage attention in America there is hardly an idealist to be found, and in slightly lesser degree the same tendency is apparent in other countries. What is the significance of this fact?

If we uncover what pragmatists and realists are trying to do in their philosophical speculations we shall see the indelible stamp of the purpose of science

as the latter has been described in the preceding pages, but these philosophies have been influenced in different ways, each of very great concern.

Both pragmatism and realism are united in a common and basic opposition to idealism. In the broadest meaning of realism, which such opposition furnishes, both are realistic. They would join in a vigorous denial of Professor Hoernlé's definition of the fundamental purpose of philosophy and in a deep-seated distrust of the philosophical promise of the attitude there expressed. The purpose of philosophy, they would say, is to understand the world, but not to insist beforehand that this understanding must polish it into a scene of perfection and consequently render it an object of love or worship. Such precommitment to an optimistic interpretation both would regard as highly dangerous, since it might easily plunge us in intellectual dishonesty. It might encourage one to blind himself to those aspects of experience which involve evil, pain, and ugliness, or at least commit him to a too facile justification of them as always transient and always issuing in some more durable good. The philosopher's duty is to face the event without any such moral or religious bias so far as it can possibly be quenched. In short, just as modern science had to dismiss as irrelevant the appeal to final causes before it could really get under way in the exact and objective interpretation of nature (which means, as we saw, that it had to free its thinking from the harassing assumption that every-

thing that happened took place for the sake of some good), so these contemporary philosophies claim freedom for our thinking in general from the same kind of appeal; they are convinced that unless it is resolutely abolished there is the same danger of a suborned and hence untrustworthy metaphysic that threatened three hundred years ago of a traditionalist, unverifiable, and hence not confidently applicable science. Philosophy, like science, must promise no final comfort for human cravings. Sound speculation, accordingly, from their standpoint, does not seek at-homeness in the universe except in the very limited sense that exact understanding always yields a greater touch of familiarity in dealing with its objects than was present before. It may combine this feeling of familiarity with a posture of complete neutrality as regards the ultimate issue between optimism and pessimism, or even with a stanch if futile opposition to the universe instead of reverent worship.

Pragmatists and realists thus place unbounded faith in the feature of scientific method which consists in extruding from our explanatory thinking a bias toward a genial result. The notion that philosophy must not only satisfy our desire to understand but also other vibrant interests, can and should be routed. All our thinking, on the most ultimate problems as well as those with which empirical science deals, must be purged of this original sin, on pain of forfeiting the impartiality which is always a part of

its aim and giving rise to what may prove illusory confirmation of extra-intellectual hopes. In what way and how far this faith is justified we shall ask in due time; at present the vital point is to see vividly its continuity with the growth of scientific method in modern times.

Beyond this focus of their common opposition to the cheery assumption of idealism pragmatists and realists tend more or less to part company. But in the major emphases on which they thus diverge we may again clearly detect the efficacy of science.

The fundamental motive of pragmatism is to universalize the tentativeness, the readiness for continued change and growth, which as we saw in the last chapter is one of the pervasive qualities of scientific thinking. For pragmatism the realm of knowledge as well as the world of reality is always and essentially incomplete. Time is strenuously real, in its obvious and universal character of creation, of the ceaseless production of novelty. Nothing is fixed, all is process. At every moment old things are passing away and new things are coming to be. The pragmatist distrusts any distinction between the world of human experience and any supposed world beyond it. If experience is eternally changing, then reality is changing, for reality is experience. If human knowledge is never final, but in process of constant enlargement and self-correction, where lies the warrant for postulating a being who is actually omniscient and can accordingly learn nothing new, or

a realm of meanings eternally fixed? Not only, so holds the pragmatist, is it wise to surrender the craving for certainty at the points where science has already renounced it in favor of frank readiness for novelty; this attitude is the only judicious one in all our thinking. Become adventuresome; abandon the attempt to hold fast to your neat intellectual abodes, and strike out into the wilderness of reflective discovery. It is always more important to uncover a better idea than to hold fast to even the best one that past achievement has captured.

That this shift is at bottom one of controlling attitudes rather than a demand of objective facts has been clearly recognized by the pragmatists themselves. An oft-quoted passage in William James confirms this in his usual breezy style.

"The history of philosophy is to a great extent that of a certain clash of human temperaments. . . .

"Now the particular difference of temperament that I have in mind in making these remarks is one that has counted in literature, art, government, and manners as well as in philosophy. In manners we find formalists and free-and-easy persons. In government, authoritarians and anarchists. In literature, purists or academicals, and realists. In art, classics and romantics. You recognize these contrasts as familiar; well, in philosophy we have a very similar contrast expressed in the pair of terms 'rationalist' and 'empiricist'; empiricist meaning your lover of facts in all their crude variety, rationalist meaning your devotee to abstract and eternal principles. No one can live an hour without both facts and principles, so it is a difference rather of emphasis; yet it breeds antipathies of the most pungent character between

those who lay the emphasis differently; and we shall find it extraordinarily convenient to express a certain contrast in men's ways of taking the universe by talking of the 'empiricist' and of the 'rationalist' temper. . . .

"Pragmatism represents . . . the empiricist attitude, but it represents it as it seems to me, both in a more radical and in a less objectionable form than it has ever yet assumed. A pragmatist turns his back resolutely and once for all on a lot of inveterate habits dear to professional philosophers. He turns away from abstraction and insufficiency, from verbal solutions, from bad *a priori* reasons, from fixed principle, closed systems, and pretended absolutes and origins. He turns towards concreteness and adequacy, towards facts, towards action and towards power. That means the empiricist temper regnant and the rationalist temper sincerely given up. It means the open air and possibilities of nature, as against dogma, artificiality, and the pretense of finality in truth." [1]

The attempt to create a systematic apology for this transformation of attitudes bulks large in the writings of Professor Dewey. Our hesitation to extend it from the realm of physical science to moral and social problems he believes as irrational as any fear well could be. History is luminous with proof that the contrary zeal tends to engender and justify an easygoing contentment with moral codes and social institutions as they already exist. This means in effect a smug satisfaction with customs which aristocratically exploit the weak for the selfish interest of the strong. It is in precisely the realm of common human relations that the method of dogmatic finality reveals its most vicious fruits in shouldering un-

[1] William James: *Pragmatism,* pp. 6, 9 ff.

critical loyalty to institutions that long since should have been swept away if progress is to be made toward a just, not to say democratic, social order. Because it is only when a thoroughly tentative attitude of mind has been gained so that none of these supposed sanctities presents itself as final and hence to be adhered to without thought of change, and only when constant readiness is present to test them anew in the light of their perceivable consequences in terms of human good, such live tentativeness demands unstilted expression. It approves itself as everywhere better than any alternative attitude, and especially better in dealing with those matters to which established science has not been able to extend it.

Everyone is familiar today with some of the discussions that have developed around the pragmatic conception of truth. Truth or falsity in the case of any idea is to be determined, pragmatists hold, not by any passive correspondence with reality but by its consequences, that is, by what appears in the course of its active use in guiding further observations or manipulations of the relevant material. Our analysis of the method of science in verifying a hypothesis indicates that here again we have merely an attempt to universalize that procedure. The pragmatist has learned from science the lesson of distrusting any supposed truth that has not been verified in essentially this fashion, and any belief not flexibly held in frank realization that no matter how well ap-

proved at any given time it is continually responsible to consequences. Any statement claimed to be true must be ready to run the gauntlet of further testing and often radical correction as old problems lead to more careful observations and new problems emerge.

Pragmatism has already achieved such vigorous and semi-popular influence that it has created a supporting atmosphere for itself in contemporary thinking. Accordingly a very brief treatment ought to suffice in its case, and we shall turn at once to a slightly more extended analysis of realism. This trend in contemporary philosophy has not achieved any such popular influence, and for reasons that will soon be apparent.

The realist, in the main, follows science at a distant point from that seized upon as central in the speculations of pragmatists. It is rather the exactitude of science and its hobby for mathematical articulation that seem to him to express the values that philosophy needs to promote.

We may find the scent of what the realists are about if we examine one stage of the process in which we all engage when we think our way through any puzzle that enmeshes us. This is the stage at which, a hypothesis having been entertained of a possible solution of the problem, we attempt to see, by mental manipulation, what is bound up with that hypothesis, what it means in relation to other things; what must of necessity be true, in short, about mat-

ters to which we can turn for empirical corroboration, if the hypothesis be sound. As I look up from my work, for example, I notice that the children's voices are absent. Where have they gone? is the question confronting me. Now the suggestion having been conjured that they have gone down the path for the morning's milk, my thinking is at the stage in question, and unless I can push my way through it successfully I shall be unable to carry the problem on to any outcome. What I do, of course, is to ask myself mentally what facts are so bound up with that hypothesis that if they are present the hypothesis can be asserted confidently to be true. In this particular case I reason as follows: If the children have gone for the milk, then the empty bottles will be absent from the shelf on which they are placed and the little basket in which the milk is brought will also be gone. On observing then, in the further stage of empirical verification, that both the bottles and the basket have disappeared, I conclude that my suggested solution was correct, so confident am I that it is necessarily bound up with these facts in such a way that their presence constitutes an adequate voucher for its truth.

Still using this simple and homely illustration, let us ask what general problems, important for all our thinking, are here disclosed, with which people infected with philosophical interest might be persuaded to deal.

As a first and very general point, it is patent that

we can carry out this mental analysis only when we have a clear grasp of the meanings of the ideas which we use. That is, unless I am thoroughly familiar with what such terms as milk, bottle, basket, path, go, for, and the rest mean, I shall be unable even to broach intelligently such a suggestion, let alone ransack these interrelated meanings to the point where empirical testing is in order. Moreover, the more critical of these meanings, and perhaps all of them, consist in relations between observed things and events, which, as I use them in my thinking, I assume to be necessary and therefore quite dependable. I assume, for example, that milk is the kind of thing that is delivered in bottles, that these bottles are of such a size and shape as requires the children to carry them in a larger container like a basket, that absence of the bottles and basket from their accustomed places only occurs when the new delivery of milk is being brought, etc. Did I not suppose that such relations as these were a part of the meanings of the ideas made use of in my thinking it would have been out of the question to deduce any definite consequences or to have any confidence that the relation between them and the original suggestion was a trustworthy one.

Now such reflections suggest an inclusive and weighty problem. This is the problem of subjecting the ideas which at any given time form the material from which we distill hypotheses and develop deductions, to the most exact analysis of which we are

capable, bringing to light important relations that had not been noticed before, baring inconsistencies or logical gaps in meanings that had been used with too implicit confidence, in short, clearing up muddledness wherever it exists in the intellectual capital with which we perforce meet the enveloping flux and replacing it by clarity and precision. This general problem is one which philosophers of all schools have recognized and attacked; pick up almost any essay in a current philosophical journal and twenty to one you will find that this is the kind of thing the author is doing. Contemporary realists, however, have been peculiarly distinguished by the perspicuity with which they have recognized this need and the persistence with which they have attacked it.

In the second place, the ideal of exactitude which guides their studies, and the analytic method by which it is pursued, show in another way the seasoning force of modern science.

In the past, philosophers have been far too easily pleased with deliverances claiming truth about the sum-total of things. These results were reached by rhetorical bandying of ideas so elastic and vague that disputes were rife about their range of validity and hence no agreement was won as to the systems established by their aid. A considerable reason for this unsatisfactory state is doubtless to be found in the fact that idealism, as the philosophy holding the saddle, regarded explanations in terms of the pur-

pose of things as ultimately valid. In an age like that of the mediæval period, when almost everybody agreed as to the final purpose of life, this was not so likely to produce logical confusion, but as soon as in the modern era men came to be emancipated from conventional aims and to admit the legitimacy of diverse goals it was natural that purposive terms should lose their established meaning and much of their validity. Disputes arose as to the meaning of explanatory concepts about which nobody had previously raised critical question. Modern science met this situation by abjuring purposive explanations in favor of empirical observation and exact experiment; realism tries to secure the same precise, objective result by renouncing the consideration of concepts in their relation to some overarching totality like the Absolute or God and dissolving them into the more elementary meanings of which their total meaning is composed. It is from this procedure that the phrase *logical atomism* has been used to describe the philosophy of the school. Now all observation, as shown in the last chapter, is necessarily analytic, that is, it breaks up any challenging occurrence into elements some of which are familiar from past experience and hence more manageable. Since the entertaining of ideas as hypotheses and the development of their pertinent consequences depends on the analytic discovery of component meanings already mastered, it is clear that this method of clarifying ideas is much closer to the needs of our actual thinking than a

method which disdains such analysis in favor of pursuing the relations of things to an all-inclusive totality like the purpose of God. A sample of very acute analysis, typical of the sort of discussion the realists prize, may be found in any of the essays of Dr. G. E. Moore, one of the best known of British realists.

Now it is easily seen that this analytic pursuit of the meanings of terms in their precise relationships builds up an increasingly systematic structure of logical connections; in which what each idea involves in relation to all the others becomes more distinctly and fully defined. It is a structure comparable in our thinking in general to that furnished by mathematics in the field of exact science, and in this comparison the realist finds an illuminating hint of the true function of philosophy.

We are all aware that mathematics is, so to speak, the logic of exact science. I mean by this that it furnishes the quantitative structure in terms of which all laws of exact science must be couched and whose relations their deductions constantly use. Now one of the most enticing themes in the history of science is the way in which abstract thinking in the form of pure mathematics has fruitfully filled its function of outstripping the emergence of other scientific problems, as also the way in which problems depend upon the victories of mathematics if they are to be exactly stated and clearly solved. One of the most striking examples of this is the theory of conic sections, which was developed in considerable detail by

the Greek mathematicians. These ancient geometers did not dream of any application of their results to problems in other sciences; with them it was a matter of pure mathematical theory, pursued because of their spontaneous delight in the discovery of geometrical order. For a millennium and a half this theory of conic sections remained sterile, simply maintaining its place as a branch of geometry and furnishing the minds of mathematicians with a group of curves with which to play in any geometrical speculation to which they seemed relevant. Then when Descartes created his analytic geometry as a new tool for the application of mathematical theory to the astronomical problems exercising thinkers of his day, a totally unexpected application of the theory of conic sections became possible. For not only could the essential nature of the various curves be expressed in a single algebraic formula, namely the general equation of the second degree, but the whole theory of the motions of bodies under the forces of attraction and inertia proved to depend upon the mathematical principle exhibited in the conic section and symbolized by the equation. Bereft of this groundwork of pure mathematical theory spun forth without any idea of further application, the great scientists of the seventeenth century would have lacked a store of exact ideas pointing to consequences susceptible of experimental verification, to which they could fruitfully resort in their endeavors to formulate the laws of motion.

This is but a shining instance of the service which abstract mathematics is constantly rendering the other sciences which seek quantitative formulation. Now philosophy, as the realist would reconstruct it, finds its true function in performing this service for our thinking at large. It is its task to discipline and canalize the meanings of the concepts we shall need to use in our future thinking, clarifying and arranging them in an orderly system. Wherever it finds a loose or flimsy idea it should proceed to clothe it with solidity, or expel it from discourse. It is no accident therefore that realists have moved in the forefront of a most notable revolution and expansion of logical theory in recent times. In the course of this revolution not only has the ancient conception of deduction been purged of many errors, but it has been demoted to a part of a much more comprehensive system which includes the whole of mathematics and may be called indifferently logic or mathematics. The aim of this revolution is not only to reduce the assumptions of all lucid thinking to a single harmonious order, but also to provide an infinite number of exact meanings to serve as fruitful hypotheses in our attempt to deal successfully with the novelties which future experience will be sure to thrust upon us.

Of course the realist does not suppose that the results reached by such chessplay with ideas must hold without further ceremony of the world of empirical observation. To establish the validity of any hypothesis in the realm of sense-experience it must be

subjected to experimental testing in precisely the manner that science requires. Philosophy cannot anticipate such verifications; it cannot pronounce *a priori* or with finality upon the nature of the actual world, and thus it cannot justify beliefs as to the moral quality of the entire universe, nor optimistic hopes of human destiny. Its realm is the chilly and bare but immaculate playground of the logically possible. Its function is that of a generalized forerunner of scientific knowledge. As Bertrand Russell states the matter in the final paragraph of his lecture on *Logic as the Essence of Philosophy:*

"Modern logic, as I hope is now evident, has the effect of enlarging our abstract imagination, and providing an infinite number of possible hypotheses to be applied in the analysis of any complex fact. In this respect it is the exact opposite of the logic practised by the classical tradition. In that logic, hypotheses which seem *prima facie* possible are professedly proved impossible, and it is decreed in advance that reality must have a certain special character. In modern logic, on the contrary, while the *prima facie* hypotheses as a rule remain admissible, others, which only logic would have suggested, are added to our stock, and are very often found to be indispensable if a right analysis of the facts is to be obtained. The old logic put thought in fetters, while the new logic gives it wings. It has, in my opinion, introduced the same kind of advance into philosophy as Galileo introduced into physics, making it possible at last to see what kinds of problems may be capable of solution, and what kinds must be abandoned as beyond human powers. And where a solution appears possible, the new logic provides a method which enables us to obtain results that do not merely embody personal idiosyn-

crasies, but must command the assent of all who are competent to form an opinion." [1]

I trust that this statement of these growing movements in contemporary philosophy, cursory though it is, has not only shown undeniably the influence upon them of the spirit and method of science, but has also brought striking confirmation from the field of philosophy for the conviction that these scientific values of tentativeness, exactitude, and the rest, mirror deepseated human needs and indicate the direction in which all sound growth in thought and character must take place.

We have long enough been occupied by preparation and indirection with the conflict between science and religion. To a square facing of that conflict and an attempt to outline what the preceding discussion means for religion we may now turn.

[1] Bertrand Russell: *Scientific Method in Philosophy,* ch. II.

Chapter V

THE CONFLICT OF SCIENCE AND RELIGION—AND THEIR RECONCILIATION

We recur to the form usually taken by the conflict of science and religion in the modern world. This has consisted in the establishment, from time to time, by scientific research, of conclusions which violated ideas precious to religious feeling, followed first by bitter attack on the conclusions in defense of the jeopardized beliefs and second by gradual adjustment of religious feeling to the notions scientifically authenticated. There have been two critical periods of such conflict to date. One was the overthrow, by the Copernican astronomy, of the whole mediæval cosmology which at the beginning of modern times comprised the set of ideas about the world in terms of which men's religious experience developed, and which produced an intellectual and emotional struggle of centuries before men learned to be religious again in face of an infinite universe in which our earth is but a speck of cosmic dust. The second was the downfall of man's supposedly privileged position in the biological world by the Darwinian theory of

evolution, whose later stages are present to our very eyes. A third transformation is doubtless beginning to have general public influence, arising from the application of scientific canons of historical research to the study of the Bible.

Now as we look at these illustrations of the conflict we note that on the one hand science continues to apply its method to whatever new problems excite the interest of scientific men, while on the other the persistent attitude of religious folk in response to the situations thus created is a feverish eagerness to remain loyal to as much of the ancient faith as can still be embraced with some recognition of the rights of scientific truth. "How much can I still believe?" is the question pathetically asked. And because of this frantic zeal to cling to as much as can be held, coupled with the necessity of surrendering what science demands to be surrendered, we see the tendency in modern religious thought to whittle down, from generation to generation, what are judged to be the essentials of faith. Beginning with two score or more doctrinal articles there ensues a process of elimination and attentuation till today, in liberal circles, the minimum creed seems to have been reduced to three tenets: belief in God, confidence in immortality, and conviction of spiritual uniqueness in Jesus of Nazareth. And both religious intellectuals and pious scientists seem to spend much of their energy at present in the attempt to prove to themselves and others that science has discovered nothing and is not

likely to discover anything that will upset this trinity of fundamentals. Thus the pathetic game of give what must, hold what can, continues.

But if our analysis is on the right track the conflict is really much deeper than this, and religion will for ever continue this hopeless reconciling without becoming reconciled unless the true nature of the conflict be clearly grasped and the only way of genuine reconciliation be frankly adopted. The conflict is at bottom one of fundamental attitudes, of pervading ideals as to what is of greatest value in life. The ideal of science is that of intellectual honesty and social verifiability, pursued in an atmosphere of complete tentativeness and mutual cooperation. The ideal of religion has been that of personal salvation, attained by inflexible loyalty to some revered leader, institution, or doctrine. It is this conflict of ideals that must be once for all resolved if a harmony of religion and science is to be won in the modern world comparable to the profound unity of the two in the great age of unquestioning faith.

Now if this be granted it is evident further, from the considerations of our introductory chapter, that the ideal of science, once some of its fruits have been tasted, cannot be surrendered by any of us, and accordingly reconciliation cannot be secured by abandoning science in favor of religion. For in the interest of life itself, to say nothing of prosperous life, it is imperative to grasp those regular relations which condition control of the factors on which life

depends, such as the procuring of food, the maintenance of group relations needed for protection and economic cooperation, and the like. The method of science is but a generalized extension of the method we all have to practise in these practical matters, both in its goal of universality and exactitude and in the readiness to hold ideas flexibly and readapt them at any time to changing circumstance. Even the most rockribbed fundamentalist becomes scientific when he seeks confidently controllable causes for the breakdown of his Ford or for the leak in the roof of his barn. He wants a cause which has a regular relation to the unfortunate effect, and if his first guess as to what it is should miscarry he is ready to try other hypotheses. It is safe to say, then that without some genuine sharing of the scientific attitude none of us could acquire and use freely the knowledge necessary for successful living, such is the insistent implication of the method of science with our practical needs.

Accordingly we must either dichotomize experience and accept the sway of science over some matters while adopting a contrary attitude in dealing with others, or else we must find some way of remoulding religion into harmony with the interests of science. The former method is of course the one characteristic of modern thought; it is still popular with that vast majority of folk who are naturally unwilling to abolish either of two such stalwart expressions of human need. But its ultimate futility has al-

ready been sufficiently remarked. It is precisely the kind of reaction to the conflict that has issued in an endless reconciling without any real reconciliation. No intelligent man who feels deeply the reality of religion can well rest satisfied with such a discouragingly ceaseless retreat of the cohorts of religion before the march of science, realizing as he must that everything religion possesses by that method it does so simply because science has not yet happened to demand its surrender. A flying army with no point at which to make a positive stand will soon be extinguished.

The one available general alternative then is that religion reform itself from the ground up, to the extent of becoming through and through harmonious with the spirit of science. Can this be done, and anything properly entitled religion still remain?

To answer this question we must engage in a brief survey of the history of religion and note what seems to be essential in it, what not. As a result of that survey we shall see that while religion everywhere begins with an object of worship characterized mainly by power, its development is marked by the will to characterize that object more and more by goodness and to surrender whatever elements in the conception are found inconsistent with the ideal of goodness. The early stages in this history are disclosed most clearly in the religion of peoples who had not yet attained intellectual and moral culture. Their gods are primarily invisible beings who are feared

and placated because it is on their power that the welfare of the community depends. The fear of the Lord is for them the beginning of wisdom. Other elements due to some sense of family kinship with these beings are not absent, but this is the main factor in the conception and it determines most of their religious practice.

As intelligence grows and moral consciousness becomes more live and active, however, fear inevitably becomes transcended as the central motive in man's relation to the gods. To become intelligent and morally self-conscious means that one can no longer bow down in abject fear, terrified by external power. For such realization of individual selfhood spells emancipation from the control of mere force; as the Stoics so vigorously insisted, the man who has attained this realization can be mastered by nothing outside of him except so far as he is willing to yield to its sway. Even torture cannot force him if he will not flinch. Such a man is free, superior to the whole world of external power. He has discovered something of ultimate value within, attested by his sense of self-respect and personal dignity, which cannot be made to quake by terror of anything outside. The consequence for religion of this emancipation is momentous. From this point on man cannot worship God because of the mere display of omnipotence; the fact that God can punish him for rebellion is not enough to prove that he should not become a rebel. Now he can worship only what his moral conscious-

ness tells him is good, worthy of worship, and sheer power in the guise of deity no longer has any claim upon him. The gradual attainment in the race of this moral self-consciousness is accordingly paralleled in religion by the gradual ascription to the deity of ideal qualities in addition to those of power, and the equally gradual elimination of elements hopelessly warring with these ideal qualities. God becomes more and more essentially the ideal of human character, for the moral man who has gained freedom from fear of power and realizes that in his moral selfhood lies the thing of ultimate worth can experience the emotions of reverence, awe, and worship only before what enshrines such an ideal of goodness.

This moralizing of the image of deity is the striking feature in the history of the religions of civilization. We in the western world are of course familiar with it in the form it took in the development of Judaism and Christianity. The great spiritual leaders whom we refer to as the prophets are the significant figures in this process of moralization, and a piece of spiritual writing like the book of Job is of intense interest as revealing a temporary insistence on full moral selfhood in a man's relation to God. Through most of the drama Job refuses to surrender his immediate consciousness of integrity in face of the pain and haunting fear that preyed upon him. In the end, of course, he gave way and succumbed to the display of divine power magnificently paraded before him; he did what many pious souls have done in

similar straits in all ages. On plea of finite ignorance of many things he surrendered the one item of certain knowledge of which one would think he must have been master, namely his own consciousness of what was morally good and hence alone worthy of worship.

In the gospels this course of emancipation is verbally carried to the limit. Love is pronounced the supreme thing in the world; God is identified with love, and it is said that he that abideth in love abideth in God, and God in him. But this was probably not meant without some qualification, just as contemporary preachers do not quite mean it when they preach sermons on love and then refuse religious fellowship except to those who interpret love as spelling loyalty to the same historic tradition. At any rate throughout Christian history we see the same process of moralization going on that went forward among the Jews. The Gothic converts of Christianity had not by any means at the time of their conversion attained the degree of moral selfhood achieved in the later prophets, hence the same tedious and lengthy course of moral emancipation in religion had to be traversed again. Tertullian, whose assertion that one of the joys of the saved would be their possession of ringside seats from which they could lean over the celestial ramparts and watch the sizzling of the damned, may be thus compared to the early Hebrew sages who supposed that their special contract with Jehovah meant mainly the assurance of

prosperity for Israel at the expense of less fortunate neighbors. We need not attempt to survey all the intervening stages, but it is certainly an encouraging sign that during the last two centuries fear of hell has greatly declined as a motive in religious experience, so that no evangelist today dares to attempt weaving an emotional spell over his audience, counting upon such fear as a direct resource. Nonetheless it is clear that full moral emancipation has not yet been widely achieved. The persistence in Christian attitude of such tendencies as have been formulated with intellectual consistency in the Calvinistic theology is a sobering indication of this fact. There is present of course an eagerness to insist that God is good, but this insistence is combined with an ultimate readiness to play safe, to flatter mere power if that should turn out to be necessary to flank the pains of divine punishment. The shape in which this has usually been justified by theologians takes its cue from the argument of the book of Job. In order to save the belief that a good God ultimately controls the entire creation and thus excuse the frequent displays of immoral energy in nature, it is maintained that God's goodness is different from that of men and of a higher sort, unintelligible to finite minds. It is right to worship him, though we should be careful about imitating him. The hideous consequence of this hypocritical makeshift on religious practice and character is too evident around us to need comment.

The frantic resistance in human nature to this

whole effort to drive out fear of power from our religious feelings and to bring ourselves to the point of willingness only to worship what can approve itself as good to our conscience is beautifully expressed in a famous passage of Bertrand Russell.

"The savage, like ourselves, feels the oppression of his impotence before the powers of Nature; but having in himself nothing that he respects more than Power, he is willing to prostrate himself before his gods, without enquiring whether they are worthy of his worship. Pathetic and very terrible is the long history of cruelty and torture, of degradation and human sacrifice, endured in the hope of placating the jealous gods; surely, the trembling believer thinks, when what is most precious has been freely given, their lust for blood must be appeased, and more will not be required. The religion of Moloch—as such creeds may be generically called—is in essence the cringing submission of the slave, who dare not, even in his heart, allow the thought that his master deserves no adulation. Since the independence of ideals is not yet acknowledged, Power may be freely worshipped, and receive an unlimited respect, despite its wanton infliction of pain.

"But gradually, as morality grows bolder, the claim of the ideal world begins to be felt; and worship, if it is not to cease, must be given to gods of another kind than those created by the savage. Some, though they feel the demands of the ideal, will still consciously reject them, still urging that naked Power is worthy of worship. . . . But others, not content with an answer so repugnant to the moral sense, will adopt the position which we have become accustomed to regard as specially religious, maintaining that, in some hidden manner, the world of fact is really harmonious with the world of ideals. Thus man creates God, all-powerful and all-good, the mystic unity of what is and what should be.

"But the world of fact after all, is not good; and in submitting our judgment to it, there is an element of slavishness from which our thoughts must be purged. . . . When we have realized that Power is largely bad, that man, with his knowledge of good and evil, is but a helpless atom in a world which has no such knowledge, the choice is again presented to us: Shall we worship Force, or shall we worship Goodness? Shall our God exist and be evil, or shall he be recognized as the creation of our own conscience?" [1]

The ringing answer which must in the end be given to the miserable rationalizations of Calvinistic and similar theology by a man fully conscious of his moral selfhood is that given by John Stuart Mill to the same gruesome impieties as spun out by Dean Mansel:

"If, instead of the 'glad tidings' that there exists a Being in whom all the excellences which the highest human mind can conceive, exist in a degree inconceivable to us, I am informed that the world is ruled by a being whose attributes are infinite, but what they are we cannot learn, nor what are the principles of his government, except that the highest human morality which we are capable of conceiving does not sanction them; convince me of it, and I will bear my fate as I may. But when I am told that I must believe this, and at the same time call this being by the names which express and affirm the highest human morality, I say in plain terms that I will not. Whatever power such a being may have over me, there is one thing which he shall not do: he shall not compel me to worship him. I will call no being good, who is not what I mean when I apply that epithet to my fellow-creatures; and if such

[1] Bertrand Russell: *Mysticism and Logic*, p. 48 ff.

a being can sentence me to hell for not so calling him, to hell I will go."[1]

The moral of this rapid historical survey is that the one absolutely vital element in religion for an age seeking to progress in intelligence and in sincerity of purpose is that its object of worship should be identical with, or at least include without inconsistency, the supreme ideal of goodness which that age has been able to conceive. Whatever else God is, he must be good; in Platonic language, he must be The Good. He must embody moral perfection. Anything short of this will in the nature of the case be inadequate and transitory; and if we are to judge by the distant trend of history more will be superfluous, since anything else seems capable of abandonment under the pressure of intellectual necessity so long as this crucial thing is fastened upon with greater clarity and the currents of religious feeling gradually drawn to surround it.

The consequence of this for our whole problem of attaining a genuine reconciliation of science and religion will soon engage us directly, but we must first consider the peculiar form taken today by the failure of liberal tendencies in Christianity to win the full spiritual freedom toward which this lengthy evolution points.

The external power which still holds liberal religion in captivity and estops it from attaining the

[1] J. S. Mill: *Examination of Sir William Hamilton's Philosophy*, p. 102.

full identification of deity with moral goodness is the power of a great historic tradition, appealing almost irresistibly as that tradition does to some of the strongest and best emotions of human nature. The vigor of our attachment to this tradition, the loneliness and cosmic weakness which even the most daring souls appear to feel when withdrawn from its support, furnish the most astonishing testimony both to the might of the human craving for an absolute focus of certainty and to the real grandeur of the ideas achieved in that prophetic past from whose encircling attraction we thus feel ourselves unable to pull away. But the free soul must emancipate itself from worship of the past, however great its contribution to our moral life, just as it must rise beyond the worship of any other external power. An ideal of perfection can never reside in the past, it can never be fully embodied in anything already achieved. A moral self can never worship any merely past revelation of divinity. Consequently for such a self there can never be anything absolute in past tradition; that which has already been realized in the way of spiritual attainment exists for it as a means in the pursuit of the good, it can never be itself identified with that good. And the inability of liberal religion today to recognize this truth and act upon it honestly spells its failure to make the ultimate and drastic sacrifice that must be made if western religion is to attain the goal of its tortuous pilgrimage and at the same time become capable of reconciliation with science.

If this criticism lacks decisive point by its generality, we shall hasten to the crucial illustration. Drive a religious man of liberal persuasion today away from every other tenet that used to be held fundamental in the Christian philosophy of history, and he will come back to one point of historic fixity which he feels must be insisted upon as absolute. There is something in Jesus of Nazareth which is ultimate, to be maintained without reservation and never surrendered. If it is not his deity it is his divinity (a distinction which at one stage of recent theological discussion was of considerable moment); if it is not his divinity it is his unique leadership in the spiritual enterprise of humanity. Detach a pious soul from something final in the historic Jesus and he is lost, religiously speaking.

Now there is, as already intimated, in this insistence upon a point of ultimacy in religious tradition something which can never be reconciled with the social universality and tentativeness essential to the attitude of science, as also something inconsistent with the moving genius of religious progress itself.

Is it not quite clear that any such ascription of absoluteness to Jesus is inconsistent with the scientific attitude? For on the one hand scientific study of history might be led to the conclusion that no such individual as Jesus ever really existed; it might be that most of the brief data which the two main sources of our gospels give about him represent the clustering around some much more meagre person-

ality of religious dramas long thrilled over in oriental thinking. This may not prove to be the most probable account, but how can it be held *a priori* impossible by a scientific mind? For my part I surely expect that the hypotheses suggested a decade or two ago by Drews and Robertson, and still more persuasively if less impartially by Gerald Massey, will be taken up again by historians, with whatever outcome may be justified by the available facts.

On the other hand, even if no such difficulty as this stood in the way, a scientific mind would have to recognize that adherents of other religions make similar claims about the founders of their faith, and it would have to engage in a quite impartial comparison of these various founders in order to see just what merits could honestly be ascribed to each. But willingness to engage in such an enquiry transcends at once the attitude of absolute loyalty; one cannot honestly compare individuals with each other if his thinking is ultimately controlled by a lurking commitment of feeling to a particular one of them. Moreover, once such an impartial enquiry is really entered, it can never result in attributing finality to even the prophet who appears as a result of that enquiry most worthy. For in the nature of the case it would have to be remembered that some other individual might appear at any time superior to any in the group compared, and also that further historical records might come to light which would change the verdict even with reference to them. In

other words, the resulting attitude would have to maintain the flexibility and tentativeness without which the enquiry could not get under way, and which are inherently inconsistent with locating any absolute focus of religious feeling in a historic individual. Can science be barred from investigating these questions of history and comparative ethics? On what grounds? We see, in short, that so far as religion insists upon any finality in past tradition, thus submitting to the fascination of what is external to the present needs of men, it is quite irreconcilable with the scientific outlook.

But to clinch the lesson to which all this points and unite the two threads of scientific interest and religious history, it is imperative to note that the same attribution of finality to Jesus or to any other focus in the past is inconsistent with what is best in western religious experience itself. Religion is not only in conflict with science by reason of its tendency to hug, in however attenuated form, its traditional loyalties; it is in conflict with itself for the same reason, and the conflict can only be overcome by the complete surrender of such inflexible attachments.

That love is the greatest thing in the world and that God as at once the highest ideal and the supremely real is the spirit of love wherever it be found, the reader will probably accept as the most enlightened and the most soberly appealing assertion in our sacred tradition. As noted above, it has not quite been meant without reservation, but if we

should dare to take it seriously it would at once tear us loose from all fixities of historical loyalty and render our religious thinking as flexible as the most inexorable champion of science could ask. What does it really mean to love my neighbor? Well, if I love him I shall be sincerely interested in his welfare, and this means that I shall be eager to help him solve his own problems in the form which they take in his own experience, and that in my relations with him I shall not want to insist upon anything which he does not actually find of help in meeting his difficulties. Can this attitude of sincere helpfulness which intelligent love must mean be combined with insistence upon ideas derived from past tradition as final? Obviously not. If I love my neighbor nothing will be farther from my purpose than the attempt to force his experience into any preconceived mold of my own; I shall cherish no dogma as to what his salvation must mean or as to how it is to be secured. By his salvation I shall mean the solution of whatever real puzzles press upon him, whether they be similar or found different to those with which I am already familiar; it is not my business, for example, to conduct him safely to eternal bliss in a world beyond unless such celestial bliss is the thing he most deeply wants. And whether his greatest need is for this or for something else, I shall surely not insist that a belief about or attitude toward Jesus, or anyone else in past religious history, is to be taken as a necessary means for the satisfaction of his need. I shall want him to make use of what

we know about Jesus where such knowledge proves of value to him, to subordinate it freely to other ideas when in his experience others are found to be of greater value. If my love is sincere, in other words, my attitude must be one of entire tentativeness toward even the noblest ideas and the most appealing emotions that come to me from my own particular religious heritage, for only so can I be entirely ready at any time to appreciate the real nature of the religious puzzles that disturb my neighbor and aid him in attaining the kind of answer that will meet just his difficulties and not those of myself or of some other persons who are long since dead. If it be really true then that he that abideth in love abideth in God and God in him, the gospels wrestle with inner conflict; it can hardly also be insisted upon that God is uniquely revealed in any particular historic individual. How far he is so can only be discovered in the pilgrimage of a given soul by the extent to which reference to that individual actually proves of spiritual illumination. What extent this will be can hardly be asserted in advance, any more than we can assert in advance which poet a budding student of literature will come to prefer. Recognition of this fact means willingness to hold all such historic references tentatively, to admit that in this or that respect other individuals may have been superior to the one we personally admire, and readiness at any time to readjust our religious notions as interest in the problems of others requires it. To love is to be more in-

terested in meeting a genuine present need of some troubled comrade in life than in clinging fast to a set of notions emotionally precious to oneself.

The bearing of this upon the attainment of world unity is too patent to need elaboration. It has often been noted by men consumed by the passion for world unity that religion as it exists is decidedly a divisive as well as a unifying force in human life. In our discovery of that element in religion which keeps it in perennial conflict with science and in contradiction to its own deepest insights we have at the same time laid bare the separative poison that has made religion a source of war, persecution, and racial antagonism in the world. The reason for this separative poison in religion lies simply in the fact that religious feeling tends almost irresistibly to focus upon the values found precious in some limited community, and to fix itself in unconquerable opposition to the values thus precious in other communities. Except then in the rare cases where zeal for world unity has itself become the most dominant of these spiritual values, an exclusive element in our religious loyalty is inevitable. We hold to our little tribal god, even when doing so makes us devils to other folks. This poison is especially virulent in the western world, where concern for one's own salvation and eagerness to propagate the notions through which one has found personal help has been a far stronger motive than concern to appreciate the spiritual needs of other peoples and to cooperate unselfishly in their

satisfaction. Though eastern religions have not nourished the latter they have been less apt to become a nuisance on account of the former. There is indeed something uncanny about a missionary sallying forth to persuade foreign peoples to believe some historic doctrine about love, when if he vibrated with the higher music of his own gospel his activity would be something quite different and far more humane. Such are the amazing anomalies of which human nature is capable.

Religion will at one fell swoop be freed from its inner self-contradiction, its otherwise endless conflict with science, and its crime of opposition to the goal of world unity, when it really identifies God with love as the best present symbol to describe the ideal of moral goodness, and masters the fundamental lesson of what sincere and intelligent love means. That lesson, as I hope will be evident now from the whole trend of our discussion, is to be learned mainly from science. Science thus proves itself in the modern world the true, if unconscious, heir of the best deposit of early western religion. It is at this central point that religion as it might be and science as it already is converge into one, namely at the point of their brooding ideal and informing spirit. Love in religion is but the extension to the whole of life in all its phases and moods of the zeal for social universality and the attitude of live freedom and unflinching honesty that characterize science in its search for dependable explanations of things. Religion will find

itself in the modern world when it envisions its object of worship in terms that square with the human values for which science stands.

A religion and science thus brought together in one is the deepest need of the modern world. Science alone is not enough, for we cannot confine experience to the ceaseless search for laws and the application of them to further problems. Fundamental also is the human need to feel the glory of the world in the order it reveals as a system of means through which shines the ideal of good that lightens the experience of every earnest man. This ideal, rendered intellectually clear by the impartial, cold and restrained practice of scientific research, must in religious experience be suffused with emotion, giving it the warmth and beauty without which it could gain no hold upon our deeper selves. It must not merely form an intellectually justified object of worship but actually attract to itself our feelings of reverence and awe. Otherwise personality in its wholeness cannot be unified about it. That love may furnish such an object is amply attested by literature and art as well as religion. Or, putting the matter another way, it is that conception of supreme value as surrounding itself with the thrill of romantic attachment instead of merely guiding scientific research, that constitutes religious experience as opposed to the experience of cold enquiry.

The difficulty which most religious souls will feel in an object of worship enshrining this ideal of sci-

ence is that it does not seem possible to personify it in the same direct and intimate fashion in which deity is personified when identified with some actual historic individual. In the latter case a sociable imagination may play over the ideal freely, embodying it in a definite human form and creating out of it an almost visible comrade in whose comforting and inspiring company to meet the vicissitudes of life. That this is intensely satisfying to strong human yearnings no one would deny. The imaged picture of Jesus of Nazareth has probably been the source of more joy to weak and troubled but sociable souls in the western world than any less mystic mind could well believe. Must this be given up? Yes, so far as it conflicts with the greater love. But the good that can be worshipped by an intelligent moral self does not really lack personality in the sense in which the personality of God is a morally satisfying and not a limiting aspect of his nature. It is personal in the profound and wholly adequate sense that it is that which personalities at their best seek more fully to realize and in relation to which everything that is most worth while in their character deepens toward its perfection.

The fundamental question, into which all else sinks, is this: Can religious emotion be disciplined to this extent? Such a question must be faced very frankly. Earnest hearts have often accused philosophers of substituting a pale emotionless concept in place of a truly religious object, and have done duty

by reminding them that men are moved by feeling rather than by reason. Precisely so—they indeed are creatures of feeling—but that is not quite the whole story. Men have been sufficiently moved by reason for an intense conflict between scientific intelligence and religious feeling to arise. The conflict cannot be ended by turning away from reason and enveloping ourselves in mere feeling, for however passionately our emotions are attached to an unworthy god we can no longer worship him when our intelligence sees him to be unworthy. Reason does compel our feelings to grow, and to attach themselves to more adequate objects; but the process is slow and halting, both in any individual and in the race. The question is, can this remoulding of our deepest feelings be carried to its indicated limit?

There is probably no transformation of character more difficult than this. Our religious loyalties entwine themselves about our very heart-strings; they constitute our inmost being. Can we really control them by reason and conscience? Can we insist upon concentrating them on values that can dependably maintain themselves before intelligent appraisal, such as this at first rather fleeting and tenuous ideal of complete tentativeness and impartiality of socialized interest? The answer is: We *must* so control them, because nothing less can really meet our deepest need. We must envision ever more clearly the meaning of these living human values; we must hold them before ourselves persistently in all the ways found fruitful in

religious history till the wealth of our religious feelings, already forced to abandon their former objects, begin to cluster around these richer goods and feel their peculiar satisfaction in them; the process must continue till we come deeply and habitually to prize readiness to transcend any previous emotional absorption more than the most stirring emotional experience itself.

This is hard. But it is the only way to that harmony of purpose and character that all of us seek by virtue of our share in the gift of reason. And religious history if fairly studied is vastly encouraging. This is its own goal, it has ever moved in this direction. Since every great prophet has achieved something like this in his own religious experience we have no excuse for doubt that where there is a more rational *must* there are few limits to the answering *can*. Religion *can* become this, because it *must*.

Before us, too, in the enterprise of science, there spreads a foretaste in a limited range of experience of such a complete moralizing of our controlling attitudes. In the integrity, empirical flexibility, and universal social reference of the scientific interest here it is already embodied in actuality. For to be a scientist in purpose is just to care more for such a method and type of result as can progressively approve itself in the sincere searching of others than for the sense of personal certainty that comes from hugging appealing but unsharable mystic intuitions or munching the familiar fruit of a hoary tradition.

We may ponder briefly the most foundational religious doctrine of all—the doctrine of the existence of God—to illustrate more fully than our discussion of the doctrine of Christ has done what all this would involve for the structure of religious faith.

It would go without saying that a church organized in accordance with the principles so far suggested would not require belief in the existence of God as a condition of membership. For everyone whose guiding ideal is akin to the one we have described would far rather be associated in religious fellowship with an avowed atheist who sincerely sought the welfare of his fellowmen than with a believer in God whose faith cloaked a purpose fundamentally inhospitable to such whole hearted and forward looking pursuit of social ends. The one thing that would be vital in such a church would be comradeship in worship and human service through sharing a supreme ideal; it would be a very minor matter if some who prized such fellowship felt so little continuity between this ideal and what God has meant in traditional religion that they preferred not to use the concept. Better a church of atheists in this sense of the word than a church of theistic obscurantists or hypocrites. Names are of small moment where realities are mutually glimpsed. The reality needed is a common object of reverent attachment for feeling yielding practical guidance for action; it is not essential that all should refer to this object in the customary religious language. A petty god it would

be who cared much what people called him as long as they sincerely strove to be like him.

If this be the case with the doctrine of the existence of God, the same will apply still more strongly, of course, to other doctrines, all of which are less central in the religious creed. In short, the church will have no creed whatever in the sense of a set of convictions which must be accepted by those who wish to become members, and this will be so because all the members will be united in one very pervasive conviction, namely that the sole requisite for spiritual fellowship is the sharing of a socialized purpose. Would this conviction itself form the nucleus of a creed? No, for it would be wise not to attempt to define even this fundamental conviction so as to require affirmation of it by prospective members, lest such definitions show a tendency toward rapid encrustation after the manner of the creeds of the past. To exclude possible members who do not really share the uniting purpose of the rest, it would be better so to organize the activities of the church that benefits other than the ones naturally sought by those who sincerely shared the purpose would be reduced to a minimum. This would be a far more likely means of securing continued harmony than the use of any verbal formula, however carefully stated. When the only thing that can be gained by joining a church is the clarification and emotional deepening of appealing values through worship and common service,

then churches will not be so apt to be peopled and managed by those who seek something else.

But one who has made his own the attitude around which our whole discussion has been woven will not only not wish to insist upon any doctrine, however natural to his own thinking, as a condition of spiritual fellowship with others. He will also be much more careful about his own references to such a conception as that of God, and much more likely to use the word, if at all, on very rare occasions.

The reason for this is implicit in the whole discussion, but it may be well to attempt as clear and direct a statement of it as I can give. It rests in the last analysis on a corollary of the values which have been here presented as rightfully challenging, the corollary namely that it is more important to be like God than to insist verbally on his reality. This follows directly from the assumption that it is better to love than to fulminate some dogma about love. We may start with the observation that all men of sensitiveness and sincerity in matters religious feel something of revulsion at the ready and intimate use of the divine name by many who pose as his professional representatives. Now why should they? What is the ground of this peculiar feeling? Let us probe the question with the aid of an illustration.

Winston Churchill unwittingly reveals the point in his novel *The Inside of the Cup*. As the reader will recall, the real hero of this book (though not at

all the apparent one) is Horace Bentley, who by his wise and eager interest in the difficulties of those round him whose lives have been impoverished imparts a sense of the reality of divine love to all who come within the circle of his presence. But the name of God is never on Horace Bentley's lips. His task, as depth of suffering has evidently led him to conceive it, is not to assert or claim the existence of God, but so to live that others will through the kindliness of his presence discover the reality of God, that is, will find the world as containing him more like what a world should be if God were really behind it.

If we examine this situation closely we shall uncover the reason for what seems at first a rather paradoxical conviction, namely that to proclaim the reality of God is in general incompatible with profundity of conviction in his reality. For what does the conception of the existence of God mean at bottom? In the western world, at least, it means the conviction of a being who combines moral goodness with power so to control the world that perfect good ultimately results from all its doings. If then, my neighbor doubts the existence of God, he presumably does so because the pressure of unresolved evils upon his life or of fruitless agony in lives around him, takes away his sense of reality in the notion of God, renders it impossible for him to see a good overcoming all evil such as we mean to denote by the concept. Should I preach God to a neighbor thus sceptical, what is it that I am really doing? It is clear at once

that mere words will not remove the real sources of his pain; at most, under the emotional spell they may succeed in casting, he will forget his troubles till the press of existence throw him upon them again. If I really want him to have a grounded conviction of the divine reality, it is clear that the essential thing I must do is to emulate Horace Bentley and devote my energy to abolishing those evils that stand in the way of his discovery of God. He will know when the world of his experience has been brightened sufficiently for faith in the ultimate power of good to become pertinent on the evidence; it will hardly be necessary, or even possible (since it is the unified meaning of *his* experience that is in question) for me to tell him when that point has been reached.

Suppose that instead of thus sympathetically sharing his troubles I warble about God to him, I am in effect saying: "Whether you have been able to discover God or not, I possess him, and mean to keep on enjoying him, even if the evils that stand in the way of your experience of divinity should fail to be resolved." The inconsistency of this with the scientific insistence on the necessity of social verification and on the readiness to hold all ideas, even those of greatest emotional appeal, tentative for the sake of such social confirmation, is so patent as to need no elaboration. Such assertions of God on the part of religious zealots are in large part defense reactions; I fear the loss of something of my own undisturbed faith in God if I should mix too deeply with my

neighbor's painful struggles, so I seek protection by erecting a wall of dogmatic assertion between us, and comfort myself by assuming that it is only his sin that prevents him from accepting the authority of my quite external experience and affirming the same doctrine that I do.

If, as many kindly religious folk have done, I combine preaching about God with the practical endeavor so to share my friend's sufferings that he will be more apt to see some sense in the notion of God, there is yet a basic contradiction that demands exposure. The preaching indicates that I am still sharing his troubles only up to a certain point and with an important reservation. Were I to share them fully, I should be more eager to appreciate just why it is that he could not believe in God than to continue snugly settled in my own belief; I should be willing to cast a temporary doubt, at least, on my own faith, to surrender God for myself unless and until through the resolution of my friend's difficulties he could be rediscovered by us both. My faith in God would become contingent upon his. For another's sake I should lose the assurance of faith that together we might save it again. For me then to dogmatize God becomes essentially premature; the use of the word is impertinent till in our mutual experience divinity is rediscovered. In short, the assertion of God is incompatible with that complete sharing of the experience of others which involves no selfish reservation. To insist upon the reality of deity

is to reserve my own faith from jeopardy, and that in turn is to refuse to share the most poignant aspect of my friend's distressing lot.

We may connect this outcome more closely with the scientific assumption of universal law in its implication of the possibility of unambiguous verification by all normally constituted minds. We think of God as a being who possesses universal validity. What does that mean? Well, it means among other things that we think of him as the one God of the whole universe, rightfully claiming the worship of every soul. Now if this is the case he ought to be able to approve himself to the sincere search of every soul; if the experience of any human being is inevitably such that God cannot be discovered in it the conception of God is then no more valid for anybody else than it is for him—the universality which is an intrinsic part of the conception is lost. But is anybody's experience inevitably such? We can surely never tell till his experience is finished. If we propose to take this implication seriously, and admit that there are experiences that initially cast doubt upon God's reality, we must hold that he has real existence only so far as he can be continually rediscovered in the sharing of such experiences. For the profoundest lesson of life, wondrously dramatized in the Christian story of divine incarnation and redemption, is that it is only through the unreserved sharing of evil that evil can be transmuted to good. The term God is then perhaps only pertinent on the lips of one who has

previously been overwhelmed with doubt, and at the moment when, his pain having been transmuted by the unreserved friendliness of another, the world of their united experience takes on divine quality for both. To claim the reality of God is to make him less than universal and hence to deny utterly what we essentially mean by the concept, for it is to insist that I shall keep on believing in him whether he is able to gain reality for my neighbor or not. In short, God's universality can only be verified by his universal discovery; since that discovery is not actual in the case of all men, I cannot properly affirm the validity of the concept no matter how strongly I feel certain of it myself. I can only progressively reveal its validity by removing the obstacles that stand in the way of its appearing valid to others, and this is a matter of moral action, not of theological assertion. To do otherwise is to make oneself logically comparable to a scientist who should insist on the universal validity of a discovered law with which experiments of others were still in conflict.

It would be intriguing to apply the principles emerging from this discussion to other religious doctrines which carry a strong emotional appeal. The limits of a brief volume such as the present one forbid our embarking upon such an attempt, but the reader who has followed the preceding pages with sympathy will be able readily to glimpse the main corollaries of the attitude here portrayed on those ideas in our religious heritage which especially in-

terest him. The central theme as regards its bearing on religion is simply that it is more important to focus sympathetic and intelligent attention upon live, deepseated present needs of men as they arise than to cling to any emotionally precious deposit of the past. The past always hangs on our heels; there is never need of conscious effort to see that its values are not lost.

The purpose of these few chapters will have been achieved if we have glimpsed the human meaning and importance of this attitude, its historical dependence upon the pervading ideal which guides scientific research, and something of what can be said for its claim to a central place in the unification of life and character which all of us in some degree struggle to attain. The illustration noted of the transformation it is tending to bring about in the field of philosophy shows its actual power for intellectual reconstruction. As regards religion, the change it is initiating is yet in its beginnings; how far the transformation will actually reach waits for eyes of the future to see.